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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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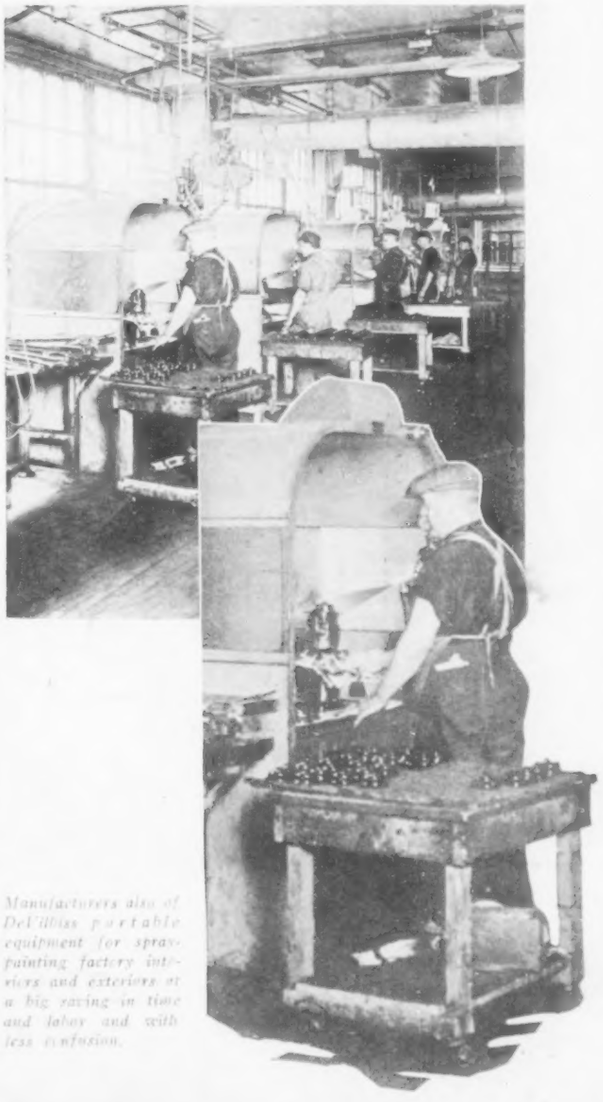

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Vol. 19 NEW YORK, AUGUST, 1921 No. 8

The Application of Decoration to Art Metal Ware

A Series of Articles Which Describe in a General Way the Various Processes and Methods Used in the Decorative Application of Ornament to Art Metal Ware. Part 2*

Written for The Metal Industry by A. F. SAUNDERS, Designer, The Benedict Manufacturing Company

ENAMELING

"Enamel is truly the metal workers' color, for in it he expresses his thoughts, to him it is what paint is to the painter of pictures."

It is difficult to determine with any degree of accuracy just when the art of enameling first came into use. The Egyptians, the Etrurians and the Greeks practiced the art in a limited fashion, although much of the early work in cloisonné proves upon close examination to be simply inlays of small pieces of colored glass cemented into the cavities or cloisons of metal composing the outline of the design. This glass inlay, however, was the direct antecedent of the art of enameling as we now understand it, the difference lying in the fact that true enamel is the glass applied in a powdered form and then fused in the enclosures.

The metal craftsman has several different processes of enameling at his disposal which are as follows: Champlevé or "imbedded enamels," cloisonné or "cell enamels," plique-a-jour or "network enamels," baisse-taille or "translucent enamels" and Limogés or painted enamels.

CHAMPLEVÉ ENAMEL

In the champlevé process the required design is cut out of the surface of the metal by means of chisels, gravers and scorpers, leaving the ornament in the form of cavities, which are then filled up with the enamel and fired. This operation is repeated as many times as is necessary to fill completely the cut outs even with the surrounding surface of metal. The face of the enamel is then ground down smooth and again fired or polished. The champlevé method is the oldest form of true enamel.

CLOISONNÉ ENAMEL

Next in importance and possibly the best known is cloisonné enamel. The first step in this fine art is the forming of the various parts of the design in very thin flat strips of metal called cloison wire. Each section in turn is carefully fitted edgewise to the metal background and held in place by a touch of silver solder. When completed the design forms a series of cells or cloisons which, after being thoroughly cleansed, are filled in with the various colored enamels, fired and finished by grinding and polishing. Cloisonné enamel when perfectly executed is without a peer. The art has been practiced in the Oriental countries for centuries and it is questionable if their craftsmen have ever been equalled in the production of this fine work in enamel.

PLIQUE-A-JOUR

The third method is what the French term plique-a-jour. This is really a variation in the process of cloisonné enamels. The difference is that when finished the enamel has no metal background as in true cloisonné. The enamel is supported entirely by the thin network of metal forming the outline of the design within the substance of the enamel. The cells in place of being soldered

EXAMPLES OF ENAMEL WORK

1. Japanese Cloisonné Enamel Vase. 2. Plique-a-jour Enamel Bowl. 3. Painted Enamel Brooch.

to a metal background are soldered together inside of a narrow supporting frame surrounding the design as a whole. This skeleton design is placed on a burnished plate of bronze or aluminum. The cells are filled in with the enamel and fired in a quick heat. When the cells are completely filled up and fired the back plate is removed by a light tap of a hammer and the transparent enamel assumes the effect of stained glass.

BAISSE-TAILLE

Baisse-taille derives its name from the two old French words, "basse" meaning low, and "taille," cut, that is,

*Part 1 was published in our issue of January, 1921.

"low cut." In this process the design is carved or worked out by a combining of engraving and repoussé in low relief below the general surface of the metal object in such a way that even the highest parts in relief do not quite reach the level of the surrounding border. When these sections in sunken relief have been filled in with translucent enamel the colors appear in the most beautifully shaded effects. The color being thinnest over the highest parts, these appear pale, while the lower or deeper parts, owing to the greater thickness of the enamel, is darker, thus producing a finely graduated effect of light and shade. Many handsome examples of baisse-taille enamels were produced during the Gothic period of the 14th and 15th centuries.

PAINTED ENAMELS

Painted enamels are carried out without any aid from engraving, carving or cloisons. This extremely fine art of enameling originated at Limoges, France, back in the 17th century. Many connoisseurs consider painted enamels the very last word in enameling as it combines both the skill of the enameler and the art of the painter.

For this work a perfect surface must be prepared for the painting. A slightly convex plate of heavy gauge metal (usually silver or copper) is coated with a layer of white enamel to form a background for the painting. The under side of this plate is also given a heavy coating of enamel to obviate the distortion of the piece during the process of firing and cooling.

SILVER BASE IN REPOUSSÉ CHASING

As the painting is done on the finished surface of the white enamel its texture must be absolutely free from any inequalities or blemishes of any sort. The greatest care is required in the firing, grinding and polishing to insure this result. The enameled plate ready, the actual painting is begun. This fine art requires the careful exactness of the miniature painter plus the chemical knowledge of the porcelain decorator. The painting is done in mineral colors mixed with Oil of Lavender. Each shade of color must be fired separately, and the colors appear most different before and after being subjected to the action of the fire. The painter must know exactly the changes that take place in the muffle.

In real Limoges enamels the figures are built up in relief by successive layers of white enamel on a background of a dark-colored enamel—blue, green, brown or black. The figures are then painted in natural colors. Sometimes parts of the design are painted in gold to heighten the effect. The chief quality of enamel, besides its extreme brilliance, is its elasticity when applied in thin layers, and it is this peculiar quality which makes enameling at all possible.

But few metals adapt themselves to the application of enamel. Gold, silver and copper are the best, due to their low oxidazation when subjected to the intense heat neessary to flow the enamel.

REPOUSSÉ CHASING

Of all the various processes employed by the metal craftsman to embellish his wares, none excel in fascination the art of repoussé chasing. Chasing is an art that fortunately has not been permitted to die. A large proportion of the sterling silver ware of the present time bears evidence of the decorative beauty of this fine handiwork, equal in every way to work of a like character of any age or country.

Chasing is divided into two styles, repoussé, meaning raised or pushed out, and flat chasing, that is, tooled in the flat without raising any of the design above the surface. Repoussé, of course, is the most interesting and requires far more skill to execute, though flat chasing possesses a certain decorative value where flatness of effect is sought.

In chasing an article of hollow ware in repoussé, say a pitcher, tea-pot, vase, cup or similar article, the first step is the scratching of the design in outline upon the outer surface of the piece. A long angular iron tool called a Snarling Iron, one end turned up and rounded off smooth, the other end turned down and held firmly in a vise, is introduced into the piece. The upturned polished end is brought into contact with the inner surface, the chaser then gives a series of sharp blows with a hammer at the base of the tool at a point just above where it enters the jaws of the vise. The effect of this hammering produces a springy stroke to the end within the hollow piece with sufficient force to bulge the outer surface opposite the point of contact. In this manner the design is gradually raised or pushed out to the required height.

The piece is now filled with pitch of just the right consistency. This is necessary because, inasmuch as the chaser must now work out the design in detail on the outer surface by continuous blows of a hammer upon the heads of various kinds of pointed shaped chasing tools, there must be something besides air to sustain the effect of the blows and prevent a caving in of the surface.

If the article is flat in form, such as a tray or waiter, the outline of the parts of the design to be raised is traced on the back of the piece, which is then imbedded in pitch face down on a flat board, and the pushing out is done with a hammer and round-faced tools of various sizes. The piece is then reversed and the details worked out with the chasing tools.

There is no process entering into the production of a piece of fine silver ware that requires closer attention to details or more skill in the handling of the tools employed.

The variety of intricate detail of ornament necessitates the use of numberless shaped small punches with different kinds of surfaces, each one made for a specific purpose. These tools are grouped into families as it were, according to their various uses. There are line, center and burnishing chasers, straight, round, half-round, oval and arch-shaped tracers, French, leaf, tint and a score of fancy matts. The above are just a few of the commonest tools used in chasing named here to give an idea of how the chaser distinguishes one from the other. The art of chasing demands in addition to intelligence a certain amount of inborn artistic feeling.

The next article of the series will explain the process of hand piercing and etching for decorating art metalware.

Methods of Casting Manganese-Bronze Test Bars as a Check on Melts of Small Castings

The Results of a Series of Experiments Made in the Foundry of the Engineering Division of the Air Service at McCook Field, Dayton, Ohio, in an Endeavor to Fix Upon a Satisfactory Method of Casting, Separately, Test Specimens of Manganese Bnze as a Check on the Quality of Small Melts*

By E. H. DIX, JR.

During the course of regular production of manganese-bronze castings for air service requirements, it became evident that a satisfactory method of casting a test bar separately as a check on melts of small castings would have to be developed. In consulting the literature on the subject and various Government and Technical Society Specifications, it was found that in general the method of separately casting a test bar is not well defined, and in several instances where a definite method was indicated, it did not seem to fit the requirements of the small experimental foundry at McCook Field. It was therefore necessary to experiment with several different types with a view to obtaining a method which would first of all give uniform results; second, would be easy to cut from the coupon using a band saw such as is found in the ordinary non-ferrous foundry, and which would also require as little machining as possible; third, one which would require only a small amount of metal, inasmuch as the melts poured in the foundry rarely exceeded 130 lb.; and fourth, it was desired to obtain a method which would give results as nearly as possible comparable with the average physical properties obtained in most sand castings.

METHODS OF CASTING TEST BARS

Fig. 1 is a photograph of the several methods which have been experimented with, all casting being done in green sand. These methods will be referred to according to their pattern numbers, as indicated. A full description of these follows.

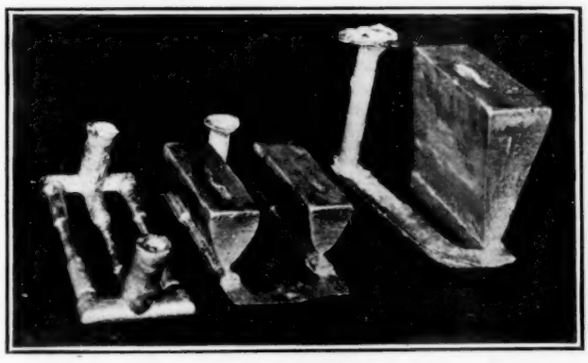


FIG. 1. METHODS OF CASTING TEST SPECIMENS
Pattern No. TB-1. Pattern No. TB-2B. Pattern No. TB-2A. Pattern No. TB-2S.

Pattern No. TB-1 is a very common method for casting test bars of aluminum, red brass, and other metals of low shrinkage. The pouring head and riser are both 1¼ in. in diameter and a 3-in. cope is used. Usually the mold was tilted so that the pouring head would be 3 in. high and the riser about 2¼ in. high. The three specimens require 6 lb. of metal. These specimens were lettered *A*, *B*, and *C*, so that the center specimen was always marked *B*. These were tested as cast, the diameter over the gage length of 2 in. being approximately ½ in. The enlarged ends were ¾ in. in diameter and 2 in. long. The bars were pulled in wedge grips.

Pattern No. TB-2A illustrates a wedge riser of a type often experimented with. This mold was also made with a 3-in. cope and the riser is 3 in. across the top and tapers down to a ⅛-in. thick web, joining the test specimen. The metal was led to one end of the test bar through a long skim gate, the gate being cut entirely in the drag. A single specimen requires about 12 lb. of metal. The test specimen is ⅝ in. in diameter over the gage length and ⅞ in. in diameter over the enlarged ends, thus allowing ⅛ in. on the diameter for machining to the standard ½-in. diameter by 2-in. gage length specimen. This specimen was always machined with threaded ends and pulled in self-aligning adapters.

Pattern No. TB-2B is similar to No. TB-2A, except that the web joining the riser to the test bar is ¼ in. thick instead of ⅛ in., and requires about the same amount of metal. In general, where both Nos. TB-2A and TB-2B were cast from the same melt, they were made up in same mold with the gating as shown in the photograph. Where either was cast alone, the gating was similar with the exception that the branch gate for the other bar was omitted.

Pattern No. TB-2S represents a method recommended by one large manufacturer of manganese bronze. The test bar is ⅞ in. square and is located in the drag with a cope 7 in. high. The wedge riser is 3½ in. across the top and tapers down to the full width of the bar (⅞ in.). It requires about 33 lb. of metal. The metal is led to the test bar through a long skim gate cut in the drag. The standard ½-in. diameter by 2-in. gage length test specimen with threaded ends was machined from the square bar.

Test Bars Cut from Ingots.—The American Society for Testing Materials recommends in its specifications for manganese bronze ingot casting metal that the test bar be cut from one corner of an ingot near the bottom. Some results were also obtained by this method as a check on the other methods employed.

Test Bars from Castings.—In order to obtain a comparison between the separately cast test bars and the test bars cut from castings, several castings have been cut up and tests made on specimens of varving sizes.

FOUNDRY PROCEDURE

All melting was done in an Iler No. 40 oil-burning furnace, the ordinary type of plumbago crucible being used. Charcoal was used as a covering for the melts. No other flux was used. The temperature was measured by means of a Chromel-Alumel couple protected by a Chromon tube. The maximum furnace temperature was taken just before the pot was pulled, and again after stirring and skimming, and this temperature is denoted as the pouring temperature in Table II. It is common practice to pour manganese bronze at the temperature at which the zinc flare is noticeable only when the surface of the metal is disturbed. This corresponds to a temperature between 1700 and 1750° F.

*Read at the Twenty-Fourth Annual Meeting of the American Society for Testing Materials in Asbury Park, N. J., June 24, 1914.

TABLE I.—CHEMICAL COMPOSITION.

Series No.	Melt No		Copper.	Zinc.	Iron.	Tin.	Aluminum.	Manganese.	Total Hardness.
1	540	As mixed.	56.6	40.0	1.25	0.50	1.00	0.61	3.36
		By analysis	56.82	40.0	1.14	0.59	0.99	0.47	3.18
	568	As mixed.	56.62	40.0	1.25	0.50	1.00	0.61	3.36
		By analysis	56.68	40.54	1.31	0.42	0.63	0.41	2.77
	597	As mixed.	56.77	40.00	1.25	0.35	1.00	0.61	3.21
		By analysis	56.67	40.15	1.41	0.53	0.74	0.50	3.18
	620	As mixed.	56.62	40.00	1.25	0.50	1.00	0.61	3.36
		By analysis	57.37	39.16	1.23	0.43	1.34	0.47	3.47
2	240	By analysis	58.05	38.64	1.38	0.49	1.37	0.06	3.31
	366	By analysis	56.98	39.90	1.18	0.88	0.97	0.09	3.12
3	271	By analysis	58.40	39.15	1.50	0.55	0.35	0.05	2.45
	431	By analysis	57.86	39.42	1.31	0.46	0.92	0.03	2.72
	433	By analysis	57.30	39.89	1.21	0.51	1.06	0.03	2.81
	435	By analysis	58.27	39.46	0.90	0.51	0.75	0.05	2.21

TABLE II.—MELTING DATA.

Series	Melt No.	Weight lb.	Percentage of Scrap	Time in Furnace, Hours	Maximum Temperature, Deg. Fahr.	Pouring Temperature, Deg. Fahr.
1	540	48	none	2⅙	*b*	....
	568	124	none	2	1800	1750
	597	127	none	2¼	1800	1760
2	620	129	none	2	1820	1720
	366	300	*a*	1½	1750	1700
3	431	100	none	1½	1750	1700
	433	100	50	1½	1750	1700
	435	100	50	1½	1750	1700

a This melt made up in three meltings of 100 lb. each, the first being all new metal and the other 50 per cent scrap from previous melts.
b Protecting tube burnt through but temperature judged by zinc flare to be 1700 to 1750° F. when pulled from furnace and it was poured immediately.

The results given in this paper are only a few of the many obtained but are representative of the lot.

Series No. 1 includes metal which was made up in the McCook Field foundry, using a hardener containing copper, iron, aluminum, and manganese, which was also prepared in this foundry. The general procedure in mixing these melts was to charge the crucible with the required amount of copper and hardener, with a liberal covering of charcoal. When the copper was melted the zinc was preheated and added piece by piece with thorough stirring. The tin was then added and the mass allowed to soak for about five or ten minutes. The pot was then pulled, thoroughly stirred, skimmed, and poured.

Series No. 2 consists of melts made up of ingot purchased from the outside. The general melting procedure was the same as in the case of Series No. 1, except that the metal was already mixed and no additions were made.

Series No. 3 consists of melts made up from another lot of ingot purchased from a different source. The melting procedure was the same as in Series No. 2.

TABULATED RESULTS

The results given in this paper are presented in three tables.

Table I gives the chemical analyses of all of the melts, and also the proportions of elements, as mixed, for the melts made up in the McCook Field foundry.

Table II gives the melting data for all of the melts.

Table III gives the results of physical tests. These are given in some detail in order that the degree of uniformity of the different methods of casting test bars may be fully shown.

DISCUSSION OF RESULTS

A consideration of the different methods of casting test bars used in these experiments shows that the results for pattern No. TB-1 are always extremely low. This is particularly true of the elongation. The results are also erratic and unreliable. This agrees with the experience of many who have endeavored to use this method of casting test bars, which, although very satisfactory for alumi-

TABLE III.—PHYSICAL TESTS.

Melt No.	Pattern No.	Specimen No.	Yield Point, lb. per sq. in.	Tensile Strength lb. per sq. in.	Elongation, per cent	Location of Fracture	Type of Fracture	Brinell, 500 kg.	Scleroscope	Specific Gravity
					SERIES 1.					
540	TB 2B	1	45,470	83,770	22.5	M. T.	.....	156	24	8.24
		2	38,900	83,370	20.5	O. T.	.....	156	24	....
		3	34,360	84,480	23.5	O. T.	.....	159	24	....
		Average	39,580	83,980	22.2	.....	.....	157	24	....
568	TB 1	3A	.....	80,280	11.5	M. T.	Jagged	163	30	8.64
	TB 1	3B	40,490	64,780	5.0	M. T.	Jagged	163	30	....
	TB 1	3C	42,710	78,910	12.0	M. T.	Jagged	163	30	....
	TB 1	Average	41,600	74,657	9.5	.....	.....	163	30	....
	TB 2A	1A	52,920	72,730	...	O. S. G.	Jagged	119	30	8.05
	TB 2B	1B	56,200	84,310	17.0	O. T.	Jagged	119	29.5	8.15
	TB 2S	2	53,790	93,110	21.5	O. T.	Jagged	124	30.5	8.55
	Ingot	....	60,930	85,490	20.5	M. T.	Jagged	119	28	8.28
597	TB 2B	2	53,990	83,630	21.5	M. T.	Jagged	130	27.5	8.10
	a	....	43,820	72,240	13.5	.....	.....	99.3	23.6	8.24
620	TB 2B	....	39,720	71,910	15.5	O. S. G.	Jagged	143	27	8.27
	a	....	43,531	69,451	12.23	.....	.....	99.3	23.6	8.24
					SERIES 2.					
366	TB 1	1A	38,790	64,650	13	M. T.	.....	48	17	....
	TB 1	1B	36,000	67,390	16	M. T.	.....	80	18.4	....
	TB 1	1C	40,800	65,520	12	M. T.	.....	100	21.9	....
	TB 1	Average	38,530	65,850	13.7	.....	.....	76	19.1	8.27
	TB 1	4A	33,420	65,750	13	O. T.	.....	55	19.8	....
	TB 1	4B	41,570	65,530	15	M. T.	.....	93	21.8	....
	TB 1	4C	39,770	68,680	16	M. T.	.....	114	21.8	....
	TB 1	Average	38,250	66,660	14.7	.....	.....	87.3	21	8.34
	TB 2A	4	34,240	65,490	16.5	O. S. G.	Granular	....	....	....
	TB 2A	6	30,610	59,790	10.5	O. S. G.	Granular	....	....	....
	TB 2A	9	34,330	67,060	17.5	O. S. G.	Granular	....	....	....
	TB 2A	Average	33,060	64,110	14.8	.....	Granular	....	....	....
	TB 2B	5	32,810	67,050	22.5	M. T.	Granular	....	....	....
	TB 2B	7	30,570	70,100	26.0	O. S. G.	Granular	....	....	....
	TB 2B	8	31,680	69,510	29.5	M. T.	Granular	....	....	....
	TB 2B	Average	31,690	68,890	26.0	.....	Granular	....	....	....
	TB 2S	S1	31,320	69,770	30	M. T.	Granular	....	....	....
	TB 2S	S2	32,190	69,370	30.5	M. T.	Granular	....	....	....
	TB 2S	S3	31,030	69,800	29.5	M. T.	Granular	....	....	....
	TB 2S	Average	31,510	69,650	30.0	.....	.....	....	....	....
240	Ingot	....	50,930	76,900	22	M. T.	Square	130	28	8.19

SERIES 3.

431	TB 1	1A	.....	68,860	19.0	M. T.	Square	....	....	....
	TB 1	1B	.....	67,020	17.5	M. T.	Diag.	.....	....	....
	TB 1	1C	.....	48,770	9.5	Flaw	.....	....	....	....
	TB 1	Average	.....	67,940	18.3	.....	.....	....	....	....
433	TB 1	1A	.....	65,090	15	M. T.	Jagged	....	....	....
	TB 1	1B	.....	69,410	20.5	M. T.	Jagged	....	....	....
	TB 1	1C	.....	62,330	12	M. T.	Jagged	....	....	....
	TB 1	Average	.....	65,610	15.8	.....	.....	....	....	....
435	TB 1	1A	.....	41,680	6.5	M. T.	Jagged	....	....	....
	TB 1	1B	.....	65,670	15.0	M. T.	Jagged	....	....	....
	TB 1	1C	.....	68,310	19.5	M. T.	Jagged	....	....	....
	TB 1	Average	.....	58,550	13.7	.....	.....	....	....	....
	TB 1[3]	2A	.....	43,900	12.0	M. T.	Cupped	....	....	....
	TB 1[3]	2B	.....	43.090	12.5	M. T.	Cupped	....	....	....
	TB 1[3]	2C	.....	75,840	22.0	M. T.	Jagged	....	....	....
	TB 1[3]	Average	.....	56,280	15.5	.....	.....	....	....	....
431	TB 2A	2A	.....	66,490	23.5	M. T.	Diag.	....	....	....
433	TB 2A	2A	.....	70,540	32.0	M. T.	Jagged	....	....	....
435	TB 2A	3A	.....	71,050	36.5	M. T.	Diag.	....	....	....
	TB 2A	Average	.....	69,360	30.7	.....	.....	....	....	....
431	TB 2B	2B	.....	70,210	30.0	M. T.	Jagged	96	23.5	8.28
433	TB 2B	2B	.....	71,150	37.5	M. T.	Jagged	100	24	8.30
435	TB 2B	3B	.....	70,260	36.5	M. T.	Diag.	105	22.5	8.33
	TB 2B	Average	.....	70.540	34.7	.....	.....	100	23.3	8.30
431	TB 2S	3	.....	70,380	30.5	M. T.	Jagged	....	....	....
433	TB 2S	3	.....	69,290	33.5	M. T.	Jagged	....	....	....
435	TB 2S	4	.....	71,230	39.0	M. T.	Jagged	....	....	....
	TB 2S	Average	.....	70.300	34.5	.....	.....	....	....	....
271	Ingot	....	44,820	71.820	33.5	M. T.	Jagged	109	24.5	8.21

[a] Average of 15 small test bars cut from casting shown in Fig. 2, Pattern No. X19342, weight, 53 lb.
[1] M. T.=Middle Third; O. T.=Outside Third; O. S. G.=Outside Gage.
[2] Not included in the average.
[3] Skin turned off reducing diameter about 0.02 in.

num and red brass, is not satisfactory for a metal of high shrinkage, such as manganese bronze.

Pattern No. TB-2A also gives low and erratic results. The reason for this is perfectly evident, in that the ⅛-in. web is not sufficiently heavy and freezes, thus preventing proper feeding action from the riser.

Pattern No. TB-2B has been found in all of the tests made to give uniform and reliable values. As an evidence of the uniformity, the three bars from melt No. 540 furnish a fair example.

Pattern No. TB-2S also gives uniform results, but ones which are believed to be fictitiously high, as, for example, 93,000 lb. per sq. in. obtained in melt No. 568.

The test specimens prepared from ingots in accordance with the A.S.T.M. specifications give results which are more nearly in accordance with those obtained from pattern No. TB-2B than any other method.

The test specimens cut from the two castings shown in Fig. 2 give an average result somewhat lower than the figures obtained from pattern No. TB-2B. It is, of course, well known that the physical properties vary throughout different parts of the same casting, so that no one test bar can represent the physical properties in a casting. However, in choosing a method of casting test bars, it is desirable that the results obtained should be somewhat comparable to the average physical properties of the general run of castings.

Pattern No. TB-2S gives results which are so much higher than the average obtained in the castings that the designer would be seriously misled by this method.

It is interesting to compare the metal in the three series on the basis of the two methods of casting TB-2B and TB-2S. Considering first the results from pattern No. TB-2S, melt No. 568 shows 93,000 lb. per sq. in. with an elongation of 21 per cent., whereas, the other two series would each show about 70,000 lb. per sq. in., with 30 to 35 per cent elongation. Thus, melt No. 568 would be judged far superior to the other two.

Considering the results from pattern No. TB-2B, melt No. 568 shows 84,000 lb. per sq. in., with 17 per cent elongation whereas, Series No. 2 shows 69,000 lb. per sq. in., with 26 per cent elongation, and Series No. 3 shows 70,000 lb. per sq. in., with 35 per cent elongation. In other words, on this basis the metal in Series No. 3 is shown to be of equal quality with melt No. 568, the only difference being that one is "harder" than the other, and Series No. 2 is shown to be rather inferior. It would thus seem that, while some metals show good properties when fed in the exaggerated method of pattern No. TB-2S, yet when put in commercial castings where this amount of feeding is impossible, the results would not be as satisfactory.

Pattern No. TB-2S is an exaggerated case of methods being employed at present. A more reasonable method

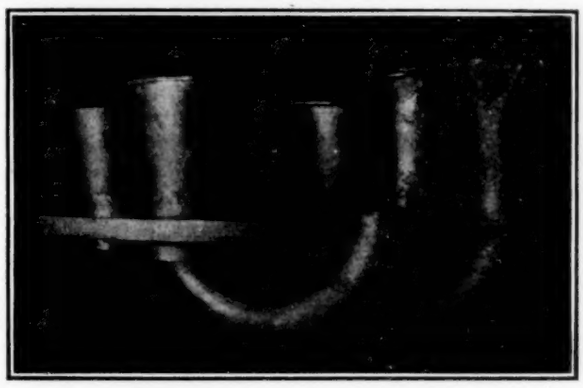


FIG. 2. CASTING (PATTERN NO. X 19342), FROM WHICH 15 SMALL SPECIMENs WERE CUT

employed by one company is to cast a block about 4 in. square and of the desired test bar length, to the bottom of which are attached two or more square coupons for test specimens. The objection to this is that it is very difficult to make a straight cut 6 or 7 in. long through metal ⅞ or 1 in. thick on the ordinary band saw, especially in a hard metal like manganese bronze. The riser in the case of pattern No. TB-2B is so proportioned that, although the web is only ¼ in. thick at the point of joining to the specimen, the riser begins to taper immediately, leaving just enough room for a saw cut, and the riser is further made sufficiently heavy so that it holds enough heat to prevent the web from freezing until the test bar is sufficiently well fed up to give uniform and dependable results. The test specimen may then be cut from the riser in the foundry and the fin ground off, so that in the machine shop it is only necessary to turn off ⅛ in. of metal.

Forgeable Bronzes and Brasses

A Description of the Most Important Mixtures Which Can Be Forged

Written for The Metal Industry by R. E. SEARCH, Exchange Editor

Q.—Can you tell us where we can learn of a bronze that can be forged? We would like a bronze as near the color of phosphor bronze as it is possible to get. Parson's and Tobin bronze are too light in color and soft. Hoping that you can help us out, we remain.

A.—There are so many forgeable bronzes and brasses that would serve your purpose in every respect save color possibly, that the best answer would be to enumerate them briefly and give some essential data concerning them.

The first and probably the best on the list as to physical properties is Aluminum Bronze. It forges like the best Swedish iron but at a much lower temperature. It works best at a cherry red heat; if this is much exceeded, the metal becomes hot-short, and is easily crushed. The rolling temperature is a bright red heat and it is a curious fact that if the metal is forged at the rolling temperature, it will be crushed to pieces.

Aluminum Brass. While alloys with 40 per cent Zn can, without regard to their percentage of Al, be forged at a dark red heat, those with 33 per cent Zn must contain at least 2 to 3.5 per cent Al, to be malleable at a dark red to brown heat. With the decrease in the amount of Al the forging temperature also decreases, so that brass containing 1 per cent should be forged only hand-warm, and brass with ½ per cent, cold. Brass with 33 per cent Zn and 3 to 4 per cent Al can be forged at a dark cherry red heat, while at this temperature ordinary brass breaks up under the hammer.

In this connection mention should be made of the forgeable copper-aluminum alloys. Small blocks of metal having the dimensions 1½ inches by 1 inch by ¾ inch were forged down hot to a thickness of from 0.2 to 0.3 inch under a steam hammer. On account of the small mass of metal they sometimes required reheating and in the case of the harder alloys were reheated several times. The forging temperatures were not stated. The results of the tests were as follows:

With addition of 1 per cent Al all of them forged without a flaw except one, which showed signs of cracking at the edges; its composition was 84.54 per cent Cu, 14.58 per cent Ni, and 0.88 per cent Al.

With an addition of 5 per cent Al one of them forged out perfectly; its composition was: 94.04 per cent Cu, 0.92 per cent Ni, and 5.04 per cent Al. Two others showed very slight cracks; their compositions were, respectively, 90.09 per cent Cu, 4.9 per cent Ni, and 5.01 per cent Al; 85.08 per cent Cu, 10.07 per cent Ni, and 4.85 per cent Al. Another one with 79.99 per cent Cu, 15.26 per cent Ni, and 4.75 per cent Al cracked badly.

With 10 per cent Al (approximately) two showed slight cracks at the edges. Their compositions, respectively, were 89.55 per cent Cu, 0.97 per cent Ni, and 9.45 per cent Al; 85.15 per cent Cu, 4.9 per cent Ni, and 9.91 per cent Al. Another alloy containing 75.13 per cent Cu, 14.95 per cent Ni, and 9.9 per cent Al broke down in the test. This series of tests will show you what you could expect to get with this range of compositions. Any alloy of this series containing not more than 1 per cent Ni, and possibly up to 4 per cent Al, could be forged without any difficulty.

Now as to color. If you desired to keep away from the golden color influenced by the presence of the aluminum, reduce the percentage of aluminum below 3 per cent and keep the nickel at 1 per cent, the balance to be copper, then the color obtained would be as close to phosphor copper as you might desire. A detailed account of these tests may be obtained by consulting the article on the Influence of Nickel Upon Some Copper-Aluminum Alloys, by Read and Greaves, in Jour. Inst. of Metals, No. 1, 1914, pp. 169-213.

Some additional forging tests on some tin-aluminum-copper alloys have been made by Prof. A. A. Read (Jour. Inst. Metals, 1916, No. 1, pp. 264-76), in which he used the same size blocks as before mentioned. The specimens were heated to about 750 degrees C. Up to 1 per cent Sn and from 4 to 6 per cent Al the forgings were perfectly sound. With 2 to 4 per cent Sn, 6 to 8 per cent Al, forged at 750 degrees C., the specimens cracked at the edges. Those containing 2 to 4 per cent Al and 8 to 10 per cent Sn were badly cracked. Those containing 8 to 10 per cent Sn and 8 to 10 per cent Al shattered at the first blow. A second series of alloys forged at a scarcely visible red heat at about 550 degrees C. with regard to an alloy containing 10 per cent Al alone and with 1 per cent Sn, although they remained sound, they were very hard to forge at that temperature; they required several reheatings. Those containing 2 to 4 per cent Sn and 2 to 4 per cent Al were perfectly sound. Those containing 6 to 8 per cent Sn and 4 to 6 per cent Al cracked at the edges. Those containing 6 to 8 per cent Sn and 8 to 10 per cent Al were badly cracked. Those containing 8 to 10 per cent Sn and 8 to 10 per cent Al shattered at the first blow. These results show that the difficulties of hot working the ternary alloys are even greater than with the bronzes and far greater than with the Al-Cu alloys.

Here, too, the color question may be satisfactorily settled by keeping the tin down to 2 per cent and the Al down to 2 per cent or less. By experimental treatment the color may be shaded very close to that of phosphor-bronze.

It is well known that gun-metal cannot be forged at red heat; in the cold or at normal temperatures the section of a bar cannot be reduced appreciably without repeated reheating. Guillet has shown (Les Alliages Metalliques, 1901, p. 571) that tests made with cast bars of Al-Sn-Cu alloys, all of them containing about 90 per cent Cu, that, although a trace of Al has little effect on gun-metal. yet when it reaches 0.4 per cent the detrimental effect on the strength, especially on the elongation, is very great. In this connection the following table shows some very interesting results:

TENSILE TESTS ON AL-SN-CU-ALLOYS

Cu by Difference	Sn by Difference	Al Per Cent	Y. P. Tons Per Sq. In.	Max. Stress Tons, Per Sq. In.	Elong., Per Cent	Reduc. Area, Per Cent
90.93	9.00	0.07	7.4	14.7	26.2	3.4
89.66	9.87	0.47	5.7	9.9	2	1.4
89.54	9.70	0.76	4.8	8.1	2	0.0
89.05	8.74	2.21	4.8	8.1	2	2.8
90.71	5.18	4.11	4.1	6.2	5	12.5
89.10	3.59	7.31	7.8	10.7	3	13.0

Relative hardness, respectively: 50-57-61-63-65-63.

Furthermore, some experiments with aluminum added in small amounts to gun-metal (not yet published, but communicated to the writer) have shown the following relative results:

With adding 0.1 per cent of Al to 88-10-2 alloy it gave a yield point of about 21,000 pounds per square inch; a

tensile strength of about 29,000 pounds per square inch; an elongation of about 7.5 per cent; a reduction of area of about 6.3 per cent, and this alloy was poured at a temperature range of 1100 degrees to 1140 degrees C. With 0.5 per cent Al addition to the same alloy the Y. P. was 17,000 pounds per square inch; tensile strength of 28,000 pounds per square inch; elongation of about 11 per cent; reduction of area 8 per cent, and poured in the vicinity of 1140 degrees C. With 1 per cent Al addition, the Y. P. was about 19,000 pounds per square inch; the tensile strength about 27,000 pounds per square inch; the elongation about 6 per cent; the reduction of area about 4 per cent, and poured close to 1100 degrees C. With 1.5 per cent Al the Y. P. was about 18,000 pounds per square inch; the tensile strength was about 23,000 pounds per square inch; elongation of about 2 per cent; a reduction of area of about 1.8 per cent, and the pouring temperature was close to 1130 degrees C. With 2 per cent addition of Al the alloy gave a Y. P. of about 27,000 pounds per square inch; a tensile strength of about 25,000 pounds per square in; an elongation of about 1.8 per cent, and a reduction of area of about 0.6 per cent, and poured at 1130 degrees C.

Another alloy of the same class, with the same amount of copper, less tin and more zinc, with the same respective additions of aluminum, showed the same relative degree of deterioration in the elongations. The first set of alloys confirm Guillet's results as to the drop in the elongations with successive additions of aluminum. Other experiments show that when aluminum is added to a true bronze in certain small quantities it does not make them incapable of being forged, yet when the same relative quantity is added to a gun-metal it does not promote their forgeability, so that gun-metal for such purposes must be excluded from consideration.

Going back for a moment to a true bronze, a composition of Cu and Sn, it has been found that an alloy composed of 80 per cent Cu and 20 per cent Sn, or 84 per cent Cu and 16 per cent Sn (Bell Metal), is malleable at a low red heat and can be forged under careful management. Somewhere in this range of Cu and Sn alloys a color similar to phosphor bronze may be obtained and with a suitable degree of hardness. A bronze of 96 to 97 per cent Cu and 4 to 3 per cent Sn works well in the rolls, under the hammer or in the dies. And it has a good deep color. Here is a bronze that might be substituted for phosphor bronze if it is hard enough. It could be hardened with a small percentage of Ni, without destroying its color or forgeability, and should approximate phosphor bronze in color.

Phosphor bronze, when properly made has a melting point about that of ordinary bronze. In cooling it shows, however, the phenomenon of passing directly from the liquid to the solid state without first becoming thickly fluid. In a melted state it retains a perfectly bright surface while that of ordinary bronze is always covered with a thin film of oxide. Phosphor bronze may be repeatedly melted without loss of tin, but the phosphorus decreases slightly. It is unusually tough and strong. In a cold state it can be rolled, stretched and hammered (forged). Its composition varies from 90 to nearly 95 per cent Cu; from 4 to nearly 9 per cent Sn; Zn from 0 to 0.34 per cent, and phosphorus from 0.17 to 0.76 per cent. Provided the tin does not exceed 12 per cent it may be forged cold.

Manganese bronze when forged is remarkable for its strength and toughness, having an average tensile strength equal to that of mild steel and elongating as much before breaking. It is suitable for forging of all kinds. With an addition of 4 per cent of 30 per cent Cupro-manganese, a red-colored alloy may be obtained similar in color to phosphor-bronze. In forging, manganese bronze should be heated to a clear cherry red (not bright) when it may be hammered, rolled, pressed and worked in any way as long as it retains any color.

It has been shown by H. F. Kalmus and C. Harper (Jour. Ind. and Eng. Chem., January, 1915, 7, p. 6) that commercial cobalt containing carbon may be readily swaged (forged) down from cast bars to wire of any desired diameter. The pure cobalt may be swaged to any extent by cooling the casting under extreme pressure followed by passing through rolls or dies between 500 degrees and 600 degrees C., reducing the cross-section slightly at each pass.

In reference to the effect of cobalt on aluminum alloys (see Elektrochemische Zeitschrift, 1914, 20, p. 295) it is stated that with 9 to 10 per cent Co and 0.8 to 1.2 per cent tungsten, or 0.6 to 1 per cent molybdenum, alloys are obtained with three times the tensile strength of aluminum and with good **forging** and rolling qualities. The molybdenum alloys are softer than those containing tungsten.

Coming to the forgeable brasses we have a manganese brass containing copper 70, manganese 30 and zinc 20 to 30 parts. It is a silver-like alloy that can be **forged** and rolled at a red heat.

Tobin bronze can be forged and stamped at a red heat as easily as steel. Bolts and nuts can be forged from it by hand or machinery when cold drawn. Its increased density and high elastic limit and the facility with which it can be upset while hot, make it well adapted for special purposes. In forging Tobin bronze particular care should be taken to work it only at a cherry red heat and not at a black heat. Its composition varies from 59 to 82 per cent Cu, 27 to 3 per cent Zn, 0.9 to 12 per cent Sn, 0.1 to 0.18 per cent Fe, 0.3 to 2 per cent Pb, and 0 to .005 per cent P.

Sterro-metal, with a composition of 55.04 per cent Cu, 42.36 per cent Zn, 0.83 per cent Sn, and 1.77 per cent Fe, can be forged if overheating be avoided, and forged cold from the casting. A specimen (tested in Vienna) forged, gave a tensile strength of 76,160 pounds per square inch. It has a specific gravity of 8.37 to 8.40 when forged or wire drawn. Its color is similar to that of Tobin-bronze.

Delta-metal (its composition is similar to Tobin bronze) can be rolled and forged hot and can stand a certain amount of drawing and hammering when cold. When cast in sand it has a tensile strength of about 45,000 pounds per square inch and an elongation of about 10 per cent. It is a brass containing small amounts of Pb, Fe, Mn, Ni and P.

Nickel is a metal that is not appreciated as it should be. According to Dr. Merica, nickel is much more successfully forged under the hammer than under a press. The metal has a pronounced tendency to crack under the slow action of the press, which may be due to the fact that the surface cools more readily than under the quick blows and short contact of the hammer. In order to soften nickel that has been worked cold it must be heated to at least 750 degrees C., the minimum temperature of the annealing range, and allowed to remain in the furnace until thoroughly heated. It may be cooled rapidly or slowly as desired, as there is no alteration in the properties of the metal produced by cooling after annealing. For the commercial annealing of nickel a temperature of 900 degrees C. should be used, as this will insure a more homogeneous metal.

Monel metal may be both drop-and hammer-forged. It can be forged as readily as iron or steel if simple but necessary precautions are taken. A low sulphur fuel should be employed for the heating (oil or gas, prefer-

ably) and the flame conditions should be neither strongly oxidizing nor strongly reducing. The metal should be heated to at least 900 degrees C. (1652 degrees F.), to not more than 1100 degrees C. (2012 degrees F.), and to secure a forging of maximum strength the forging should be finished at a temperature of from 500 degrees to 600 degrees C. (932 degrees to 1112 degrees F.). Owing to the low heat conductivity of the metal care should be taken to have the bars or ingots uniformly heated and to have the heat extend well beyond the working section. This is best realized by turning the ingot or bar quite frequently while it is being heat treated in the furnace.

Cupro-nickel, 85 per cent Cu and 15 per cent Ni, should be cast at approximately 1320 degrees C., to it add 0.03 per cent Cu-Mn before pouring. It should have a special anneal at 930 degrees C. and it can be forged at 675 degrees C.

Duralumin, a light aluminum alloy to be worked hot must be heated from 400 degrees to 450 degrees C. In cold working the metal it must be repeatedly annealed in the range from 380 degrees to 420 degrees C.

The Castings Engineer

A Profession Not Overcrowded, and Made Unattractive to Incompetents, Toolmakers and Sinecurists by Its Exacting Qualifications

Written for The Metal Industry by WILLIAM H. PARRY

This being the age of specialists in about all lines of business, there seems to be room for one more of this ilk in the castings industry. His duties are in the main to plan and solve the multitudinous problems that arise when maximum efficiency and production are demanded in pattern shops and foundries.

The usual means of attempting to arrive at the best method possible of making patterns so that the greatest number of good castings can be made therefrom in the least possible time, is for the executives of both departments to go into conference, and if both men are broad-minded and imbued with the spirit of give and take, assuming, of course, that both parties know their business, results ought to be expected. We know, however, that good results are seldom obtained from these conferences. In fact, such confabs are productive of more ill-feeling than castings.

There is nothing to be gained by going into the pros and cons of these conditions, but in passing we may mention that bristling antagonism reaching far back to the ages of the first pattern and first casting, is still present, and going strong, in the pattern shops and foundries everywhere.

For the want of a better term I am calling this specialist a Castings Engineer, and his place is in the drafting room, where, if he did not wiggle a finger at any other class of work, he could stop the crazy designing of mechanical engineers who have no knowledge of pattern shop or foundry practices. However, this would be but one of his duties, the rest of his time being devoted to planning the best method of making, and mounting, if need be, patterns so that the foundry men can turn out the best day's work possible.

Can such men be found? it may be asked. and the answer is yes, but not in overwhelming numbers, because to qualify for such a position means a life-time spent in pattern shops and foundries and keeping abreast of or a step ahead of each. There are no college courses that will qualify any aspirants for such positions. In fact, it is rather doubtful if such positions exist, not because there is not a crying need for such, but that owners and managers are too dense to realize the importance of creating them.

Just imagine having a castings engineer in your plant able to decide within a reasonable time whether a job is a green sand, dry sand or loam proposition, and able to advise the pattern makers as to whether a skeleton pattern is preferable to an expensive set of patterns and core-boxes, bearing in mind the while, that foundry costs must not be lost sight of when shaving pattern costs. Then again, on medium-sized work, such as side floor or heavy bench stuff, to have the patterns so designed and enough of them, that a lot of sand is not rammed needlessly; if the designs and orders were such that it would not pay to mount on a molding machine pattern plate whether split pattern or match plates of the aluminum breed, would give the best results, would be up to him to decide as would also the number of patterns to put on a plate to get the greatest output consistent with good work.

In this connection I can cite two instances of rank incompetence on the part of two manufacturing concerns, whose executives were not conversant with even elementary foundry practice. In the one case only one-third of the number of patterns that could easily be cast were on the plates, leaving a lot of sand to be rammed to no purpose. This concern is now in the hands of a receiver, and while it would be unfair to blame the assembly of their pattern plates for this state of affairs, yet I doubt not but what it was a contributing cause.

The other instance was that of pattern plates so designed that the metal in entering the mold had to leap over numerous hurdles to reach the cavities where the castings were formed, and strange to say, some of the castings were whole, but not wholesome in appearance, due no doubt to the molten metal being trained to run on the flat and not go steeplechasing in search of a final resting place. These plates were improperly designed in other respects too numerous to mention here. Suffice it to say that toolmakers designed and made them, which of itself is sufficient condemnation.

Another one of the numerous duties devolving upon the castings engineer would be the proper gating for all patterns—large, medium and small—and this little stunt would help him to keep busy, as it is a most important factor in successful foundry work.

The question naturally arises whether the appointment of such a man would cause a spirit of resentment on the part of the foundry and pattern shop executives. I do not deny that if these two worthies will insist on disagreeing with one another it would follow that he would be looked upon by both as a peacemaker, and treated as such usually are, both belligerents forgetting their own quarrel to pitch into him. Possibly they would look upon him as a usurper, delegated to rob them of the power dearest to their hearts, that of deciding in spite of one another, how patterns should be made.

But be that as it may, there will be a field for men of this type, if the field does not already exist, as pattern shop and foundry foremen have enough to do to keep their forces busy without having to plan how to "knock" one another.

Electric vs. Crucible Furnace

A Continuation of the Discussion Begun in Our June Issue

MR. EASTICK'S ANSWER TO DR. GILLETT

In reply to Dr. Gillett's comments (published in your July issue, page 283) on my criticism of the muffled arc type furnace developed by the General Electric Company, I am very sorry to note that Dr. Gillett appears to regard unfavorably any criticism of claims made by electric furnace manufacturers.

Dr. Gillett labels my remark regarding the power consumption of the G. E. furnace, a "sketchy comparison" and that I deliberately made such an "unsafe comparison" because a full tabulation of all items would prove something I did not want to prove. I thoroughly agree with Dr. Gillett that power or fuel is but one item only and in criticising the G. E. furnace, I pointed out the probable necessity for operating the furnace twenty-four hours a day, the probably high cost of relining, the apparent impossibility of stirring the metal, and finally, the fairly high power consumption. If the furnace referred to possessed any compensating advantages it would indeed be unfair to mention only the high power consumption.

Dr. Gillett's description of the mechanism of the vaporization of zinc is very clear. The rate of displacement of zinc vapor as a factor in zinc loss, depends entirely on the element of time. If it were possible to raise the temperature of a mass of brass from its melting point to its pouring temperature instantaneously, the zinc loss, in the furnace, would be practically nil, regardless of the rate of displacement of zinc vapor. I think, therefore, it is proper to say that time and temperature govern zinc loss. If the temperature is allowed to go unnecessarily high, of course high zinc loss results. Zinc loss, at the pouring temperature, increases with the time the metal is maintained at that temperature. Zinc loss also increases with the time required to bring the metal from the temperature of its melting point up to the pouring temperature; the factor of time in this instance depends on the design of the furnace, and the mass and surface of the metal. By allowing the pressure of zinc vapor in a tightly closed furnace to become dangerously high, possibly vaporization could be reduced; but the writer would be surprised to learn that any brass melting furnace was being operated in such a way.

It is likely that lower zinc losses have been obtained with well designed electric furnaces on account of more careful operation and faster melting than is usually the case with most fuel fired furnaces at present in use.

Crucible practice does result in metal being split in the ashes and crucibles occasionally break and leak. However, the cost of recovery of metal from ashes is comparatively low and even Dr. Gillett wouuld not deny that there are losses in metal spilled or through excessive slagging in electric furnace practice.

The statement that there is greater oxidation and slagging of metal in average open-flame practice than in average electric furnace practice on account of the oxidizing effect of the excess air over that theoretically required for combustion in the open flame is open to argument. It is not necessary to have any excess air over that required for combustion and this is entirely a matter of regulation. It does not require a Doctor of Philosophy to operate a well designed open flame furnace so that there will be no oxygen in the products of combustion as revealed by analysis.

Dr. Gillett says that he has covered the question of over all efficiency of electric furnaces from coal to metal melted in his previous letter on page 240 of the June issue. The point I criticized was that the writer of the article on the G. E. furnace was, in the case of the electric furnace, computing the efficiency from electricity to metal melted, and, in the case of the fuel fired furnace, from fuel to metal melted, which would appear to be absurd. I fail to find anything in Dr. Gillett's letter in the June issue which would indicate that such comparison is not absurd.

I thoroughly agree with Dr. Gillett in regard to the usefulness of oil lamps, electric lights, coke furnaces, etc., and I should be very sorry to feel that I have unwittingly condemned an electric furnace simply because it is electric. I also thoroughly agree that it is illogical to commend an electric furnace because it is electric, and I am very glad to have had Dr. Gillett add weight to this principle.

Montreal, Canada. THOS. H. A. EASTICK.
July 30, 1921.

"MILL CLERK'S" OPINION

In the May issue of THE METAL INDUSTRY there appears an article by "Equipment Engineer" upon melting brass in crucibles in which is given a table comparing the cost of coal fuel crucible pit fires with the cost of electric furnaces.

The writer states that the figures on crucible practice were actually obtained in the casting shop of a rolling mill and gives the production per day as 9,000 lbs. of an alloy consisting of 66% copper and 34% zinc with a zinc loss of 1.3% on 9,000 lbs.

We would like to become acquainted with the firm that can produce 9,000 lbs. of a 66% copper alloy from 9,000 lbs. of zinc.

The same error occurs in his figures for the electric furnace costs.

Also why tax the electric furnaces with 20% depreciation and $1 per ton for repairs when only 15% depreciation and 50 cents per ton for repairs are charged to the crucible pit fires?

The electric furnace makers claim that the shell and other mechanical parts of their equipment are practically good for 25 or more years and $1 per ton for repairs amply takes care of the relining cost.

Under supplies he charges the electric furnace with $1 per ton and for the crucible pit fires he charges only the crucibles.

We ask why doesn't he charge the crucible pit fires with the charcoal or similar substitute that is used to cover the molten metal in the pots and the rope and tongs used on cranes for hoisting the pots out of the fires?

These items alone average nearly 40 cents per ton of metal cast in crucible pit fires and are not used with electric furnaces.

Our writer makes his comparison between coal fuel crucible pit fires and electric furnaces, yet he does not charge anything against the pit fires for handling and treating of the resulting ashes although actual practice shows that this item costs approximately $6 for every 50 heats in a coal fuel crucible pit fire.

Furthermore, Equipment Engineer does not charge either type of melting with copper losses, yet actual practice shows that coal fuel crucible pit fires lose from ½ to 1% of the copper melted and electric furnaces with the same class of help lose from ¼ to ½% of the copper melted.

And for zinc losses the writer gives 1.3% loss for crucible fires and 1% for electric furnaces, but actual practice shows that coal fuel crucible fires lose from 1¾ to 3½% of the zinc melted and electric furnaces from ¾ to 1½%.

We agree that zinc loss is largely due to the human element, but we must also add that the electric furnace is much less susceptible to the influence or haphazardness of the human element than are crucible pit fires as ordinarily operated at the present time.

Our friend places great emphasis upon the matter of fuel conservation, but we ask which is of greater importance, conservation of man power or conservation of fuel?

The electric furnace in his table produces 3,333⅓ lbs. per man day and the cruicble pit fires produce only 2,250 lbs. per man day, hence the electric furnace is 44% more efficient in man power.

We may use up all the now known fuel elements but if we conserve our man power we will in the future, as in the past, continue to discover new and better heat elements.

Reconstructing Equipment Engineer's table in the light of known facts from actual practice we get the following comparison:

Electric furnace cost installed		$15,000
Production per day, 10,000 lbs.		
Alloy, "high brass," 66% copper, 34% zinc or 6,600 lbs, of copper and 3,400 lbs. zinc.		
Power. 300 K. W. H. per ton, 1,500 K. W. H. at 3c...		$45.00
Labor. 1 furnace tender at $7.00	$7.00	
2 moldmen at $4.00	8.00	
		15.00
Zinc Loss. 1% of 3,400 lbs. at 6c		2.04
Copper Loss. ½ of 1% of 6,600 lbs. at 13c		4.29
Supplies. $1.00 per ton		5.00
Repairs. $1.00 per ton		5.00
Interest. 7% of $15,000 at 250 days		4.20
Depreciation. 15% of $15,000 at 250 days		9.00
Total, or .008953c. per lb.		$89.53

CRUCIBLE COAL FUEL PIT FIRES

Cost installed		$5,000
Production per day, 9,000 lbs. for 5 rounds or 50 heats.		
Alloy, "high brass," 66% copper, 34% zinc or 5,940 lbs. of copper and 3,060 lbs. of zinc.		
Fuel. 3,600 lbs. of coal at $11.00 per ton		$19.80
Labor. 1 caster at $10.00	$10.00	
3 helpers at $5.00	15.00	
		25.00
Zinc Loss. 2% of 3,060 lbs. at 6c		3.67
Copper Loss. ¾ of 1% of 5,940 lbs. at 13c		5.79
Supplies. Crucibles, 3 at $7.00	$21.00	
Charcoal and rope, 40c. per ton	1.80	
		22.80
Ashes. Handling and treating		6.00
Repairs. 50c. per ton—very low		2.25
Interest. 7% of $5,000 at 250 days		1.40
Depreciation. 15% of $5,000 at 250 days		3.00
Total $89.71/9,000 = .009968c. per lb.		$89.71

It will be observed that in our reconstructed table the cost per pound is considerably in favor of the electric furnaces although we have used the high power rate of 3 cents per K. W. H., which in most localities runs from 1½ cents to 2 cents per K. W. H.

These cost figures, however, do not tell the whole story because the cost items of supervision, clerical help, liability insurance, accidents, etc., are not included therein and these items increase usually in direct proportion to the number of men employed.

Therefore, since more men are required to produce a given tonnage from crucible pit fires than from electric furnaces it follows that these items of cost will be greater for the crucible pit fires.

Our friend tells us that gas fuel offers great possibilities in connection with crucible casting, but does not give any data to bear out his belief in the matter.

May 27, 1921. MILL CLERK.

MR. EASTICK'S ANSWER TO "MILL CLERK"

Replying to the letter signed by "Mill Clerk." In stating zinc loss to be 1.3%, I based the percentage on the total weight of metal melted, which I believe to be customary practice. Apparently "Mill Clerk" bases his percentage on the weight of zinc used. I regard this as purely a detail, providing it is clearly shown how the percentage is calculated and can only assume that "Mill Clerk" is attempting to ridicule me when he states that he would like to become acquainted with the firm that can produce 9,000 lbs. of 66% alloy from 9,000 lbs. of zinc.

I am unfamiliar with the claim of electric furnace manufacturers that the mechanical parts of their furnaces are good for 25 or more years, and am still of the opinion that 20% depreciation in the case of electric furnaces, and 15% in the case of crucible pit fires is quite fair on account of the complicated electrical and mechanical equipment in the one case and the simple brick work in the other.

The lining of an electric furnace is subjected to higher temperatures and greater mechanical wear than the lining of crucible pit fires, hence the assumption of a relining cost of 1.00 per ton for electric furnaces and 50 cents per ton for crucible pit fires. I did not charge the crucible pit fires with charcoal, rope, tongs, etc., because equivalent equipment and supplies of a different nature are necessary with electric furnaces and I assumed that this item could be safely ignored in both cases.

If "Mill Clerk" is losing 1% of the copper melted with crucible practice, and ½% with the electric furnace, it would seem to be a matter for the local police force. There is no metallurgical explanation of its disappearance. In regard to the figures of 1¾% to 3½% loss based on the weight of zinc melted, my figure of 1.3% of the total metal melted is roughly in accordance with "Mill Clerk's" figures.

It is probably true that electric furnaces appear to be less susceptible to the influence of the human element than are crucible pit fires, but this is largely due to the different organization and better supervision than is usual with crucible pit fire casting shops.

"Mill Clerk" appears to be in deep water on the subjects of human conservation and the conservation of fuel; his optimism in regard to the discovery of "new and better heat elements" is quite refreshing. By the use of fuels of higher "form value" than anthracite coal and through better furnace design and application of heat, it is possible to greatly increase production per man-day and still retain the many advantages of crucible practice.

It is apparent from the figures supplied by "Mill Clerk" that his conditions are different from the conditions covered by the figures in my May article. As I said in the article referred to, cost figures depend entirely on local conditions and they also involve a series of assumptions which can only be safely made after thorough study of these conditions. I fail to see where total overhead is necessarily less with electric furnaces than with crucible pit fires, simply because there may be fewer men employed.

The writer agrees that it is necessary and desirable to publish data on the advantages and possibilities of gas fuel with crucible practice. It is to be hoped that this data will be forthcoming shortly.

Montreal, Canada. THOS. H. A. EASTICK.
July 30, 1921.

This discussion will be continued in our September issue.—Ed.

Practical Plating and Finishing Operations

FINISH PROCESS SPECIFICATIONS FOR GALVANIZING STEEL STAMPINGS IN CYANIDE ZINC SOLUTIONS*

By W. B. PLEADWELL, Cleveland Branch, A. E. S.

The following process is used by the writer for finishing sheet steel parts:

PICKLING

Load parts in a large dipping basket, about 30 per basket (Note 1), and pickle in a hot hydrochloric acid pickling solution for about 30 seconds to remove the annealing scale (Note 2).

Parts should come out of pickle bath clean, bright and of approximately a uniform color.

Rinse well in two (2) rinses of cold running water and dip in hot cleaning solution.

Without rinsing off the cleaning solution, empty the basket on racking table or in a large, clean box (Note 3).

The dip in the cleaning solution is made to neutralize the acid and to prevent rusting while being racked for plating.

They are racked six (6) to a rack, so that flat sides will face anodes.

CLEANING

The racked stands are cleaned in a boiling hot electric cleaner, using reverse switch.

Approximately 2 minutes is required to clean.

The racks are the cathode until cleaned, but just before removing from cleaning bath the current is reversed and they are made the anode for 2 or 3 seconds and switched back as the cathode 2 or 3 seconds (Note 3).

They are removed from cleaning tank and hung in reservoir tank ready for plating (Note 4).

The reservoir rinse is made slightly alkaline with caustic soda.

PLATING

The loading racks are hung in moving cathode hot zinc plating bath with the flat sides facing the anodes and plated for 18 minutes with a pressure of 3½ volts and a current density of 12 to 15 amperes per sq. ft. Solution temperature 180 degrees F.

DRYING

The racks are removed from tank and rinsed twice in clean running cold water and dried in a centrifugal dryer, without hot rinse.

ALTERNATIVE METHOD

Stands may be dried by hot water rinse provided a clean boiling hot zero water is used and extra care exercised in removing all surplus water from the stands by shaking, otherwise they will stain.

The baskets most suitable for acid dipping are known as nichrome dipping baskets.

The hydrochloric acid pickle used is approximately a normal solution.

Temperature, 200 degrees F.

FORMULA FOR HOT CLEANER

Proprietary cleaner	4 oz.
Caustic soda, 76%	2 oz.
Water	1 gal.

Temperature, boiling.

A round reservoir tank four feet in diameter with the revolving racking bar is best suited for holding these racks, both for loading and unloading plating tank.

FORMULA FOR ZINC SOLUTION

Proprietary cleaner	2 oz.
Sodium cyanide, 96-98%	3½ oz.
Caustic soda, 76%	7 oz.
Zinc cyanide	8 oz.

Add cleaner and boil, then add sodium cyanide and one-half of the caustic soda.

When sodium cyanide and caustic soda are dissolved add zinc cyanide in the form of a thin paste.

After all of zinc cyanide is dissolved, add balance of caustic soda.

*The Monthly Review, June, 1921.

SILVER PLATING STEEL REFLECTORS*

By B. HENGST, Cleveland Branch, A. E. S.

The first operation in plating reflectors is to clean and copper-plate them in a copper cleanse solution which is known to most platers, which consists of sodium cyanide, copper cyanide and caustic soda.

The work is then rinsed and dipped in a sulphuric acid pickle to neutralize the alkali. They are then plated in the acid copper solution (agitated) for 10 minutes, then, after rinsing in cold and hot water, they are placed in drying oven.

They are then ready for buffing, which is done on an automatic buffing machine, then colored.

SILVERING

The work is cleaned in a regular cleaner solution, rinsed in cold water and dipped in cyanide dip and flashed in nickel solution, rinsed in cold water and dipped in cyanide dip to neutralize the acid. They are then silver-plated, rinsed first in hot, then in cold water. This helps to avoid staining. They are then placed in oven, when dry they are ready for silver coloring.

COPPER ON STEEL

By CHARLES H. PROCTOR, Plating-Chemical Editor

Q.—I would like to copper plate steel or iron without the use of the electric current or deposit a film of copper or iron without the use of the electric current either in alkaline or an acid solution after the iron or steel is properly cleansed.

I would appreciate it if you will favor me with some formulas for making up such solutions.

After the iron or steel is thoroughly cleansed it is heated to about 80 F. and then it is put into the solution to be coated.

I would like to get a uniform solution and coating because the one I have been using does not always work satisfactorily.

A.—There is practically only one method of coppering steel or iron without the use of an electro-plating solution; that is, to immerse the perfectly cleansed iron or steel parts in a dilute solution of copper sulphate and sulphuric acid.

The following solution will give results:

Water	1 gallon
Sulphuric acid 66%	1 to 2 ounces
Copper sulphate	2 to 4 ounces

If a lighter color is desired, the addition of ⅛ ounce tin chloride will give a lighter deposit.

Solutions of this type cost little and should be replaced when they fail to give results.

It is an advantage to immerse the articles after cleansing and washing in a dilute solution of sulphuric acid and water, before immersing in the copperizing solution.

Water	1 gallon
Sulphuric acid	2 to 4 ounces

You might find an advantage in a thin sheet of copper in the copperizing solution that will encircle the receptacle holding the solution. The solution will possibly be more constant in its operations.

War Experiences in Electro-Deposition

Deposition of Tin, Nickel, Brass and Zinc*

Written for The Metal Industry by Our British Correspondent

TIN

My earliest note relates to the deposition of tin—an element which always presents difficulty.

Electro tinning was specified—in the case of a number of munition parts, fuse plugs, etc.—as a protective coating, and difficulties arose with regard to suitable plating solutions.

Tin is one of the most difficult metals to deposit in regular coherent coatings of any appreciable thickness. There are many solutions known which yield a thin coating without trouble, but to obtain a deposit of any appreciable thickness is by no means easy.

A number of different electrolytes were tried with more or less success, but practically we had to depend mainly on three, viz.:

(A) The pyrophosphate solution first introduced by Roselear (a French electro-metallurgist) and usually composed of 17 parts tin chloride, 35 parts pyrophosphate of soda, 1,000 parts water.

(B) The ammonium oxalate solution recommended by a number of authorities and consisting of the double oxalate of tin and ammonium with a little free oxalic acid.

(C) Hydroxide solution, made by dissolving a salt of tin in a strong solution of caustic soda to a strength of from 1 to 2 ozs. metallic tin per gallon, to which an addition of pyrophosphate of soda is often made.

Of these the last was adopted and used by the majority of firms within my experience who carried out this class of depositing. On the whole, it gives quite satisfactory results so long as the metallic concentration is kept fairly high.

The current conditions found most satisfactory were: E. M. F., 2 volts, and C. D., 2 amps per sq. foot.

NICKEL

The deposition of nickel also deserves brief mention at this point, for that metal was used in electro-deposition by many munition firms for bringing up to standard the weight of light shells. It was by no means uncommon in the case of firms having little or no previous experience of shell turning to have a large percentage of shells rejected for being under weight, and the electro-deposition of nickel proved a perfectly satisfactory method of remedying the fault. The principal difficulties brought to my notice in this connection were almost invariably found to arise from unsatisfactory methods of preparing shells for deposition. It is often most difficult to convince amateur electro-platers that no surface is ready for a deposit intended to be adherent that is not absolutely clean. It may be worth while to mention here that the caustic soda or potash boil—the usual method of removing grease—is not satisfactory where mineral oils and greases are concerned, and for engineering and machinery parts of any description it is **always** a wise policy to wash or brush over first with benzine or petrol, then rinse and hang for ten minutes or so in a boiling solution of caustic soda of a strength of ½ lb. per gallon. A simple pickling in dilute sulphuric acid, afterwards rinsing in clean running water, is then all that is necessary before immersion in the nickel vat; that is, of course, for such work as shells or any parts which do not need a high polish.

With regard to the electrolytes used, little need be said. The majority of firms used the ordinary double nickel ammonium sulphate solution, which contains the salt of saturation, and is kept very slightly acid. Some firms preferred to work more rapidly than this solution allows, and a solution containing single nickel salts, nickel sulphate, 200 grams, ammonium chloride, 100 grams, and water, 4.5 litres, was employed in several cases.

BRASS

Another interesting problem brought to my notice about this period was the difference between electro-brassing as carried out on the Continent and in this country. Several manufacturers accustomed to buying electro-brassed articles from Germany were in great trouble because they could not obtain from English platers the same good, clear color they had been used to seeing on German productions. I found in several cases little realization on the part of platers undertaking this work of the necessity for regular analytical control of the composition of their solutions, and I was compelled repeatedly to draw attention to the importance of the ratio of the factors of copper and zinc and free cyanide content.

I recommended with good results a solution which is due to a German electro-depositor (Pfanhauser):

Potassium cupro cyanide	20 grams
Potassium zinc cyanide	20 "
Sodium carbonate	15 "
Sodium sulphate	15 "
Sodium bisulphite	20 "
Ammonium chloride	2 "
Potassium cyanide	1 "
Water	1,000 "

ZINC

By far the most interesting of the earlier War problems in electro-deposition, however, was the case of **zinc**.

Zinc deposits on iron goods or parts have, as is well known, very considerable value as protective coatings against corrosion, and in contracts for many classes of munition work zinc coatings were specified. Some firms appeared rather shy of electrolytic processes for carrying out this class of work, but I felt then, and still feel, that for all engineering work, especially where any considerable machining has been done on goods, or where parts have been "heat treated," electrolytic deposits are infinitely more satisfactory than the so-called hot galvanized coatings obtained, as you are aware, by dipping the article in a bath of molten zinc.

In this connection I should like to refer to the classical work of Burgess, who some 15 years ago carried out a most interesting series of comparative tests on electrolytic zincing, as compared with the hot dipping process.

I have only time to give a very brief résumé of his results, but the illustration shown will furnish you with some idea of their value.

These curves are very eloquent of the superiority of the electrolytic deposits in all casts where active corrosive agents of an acid nature are liable to have access to an iron or steel surface.

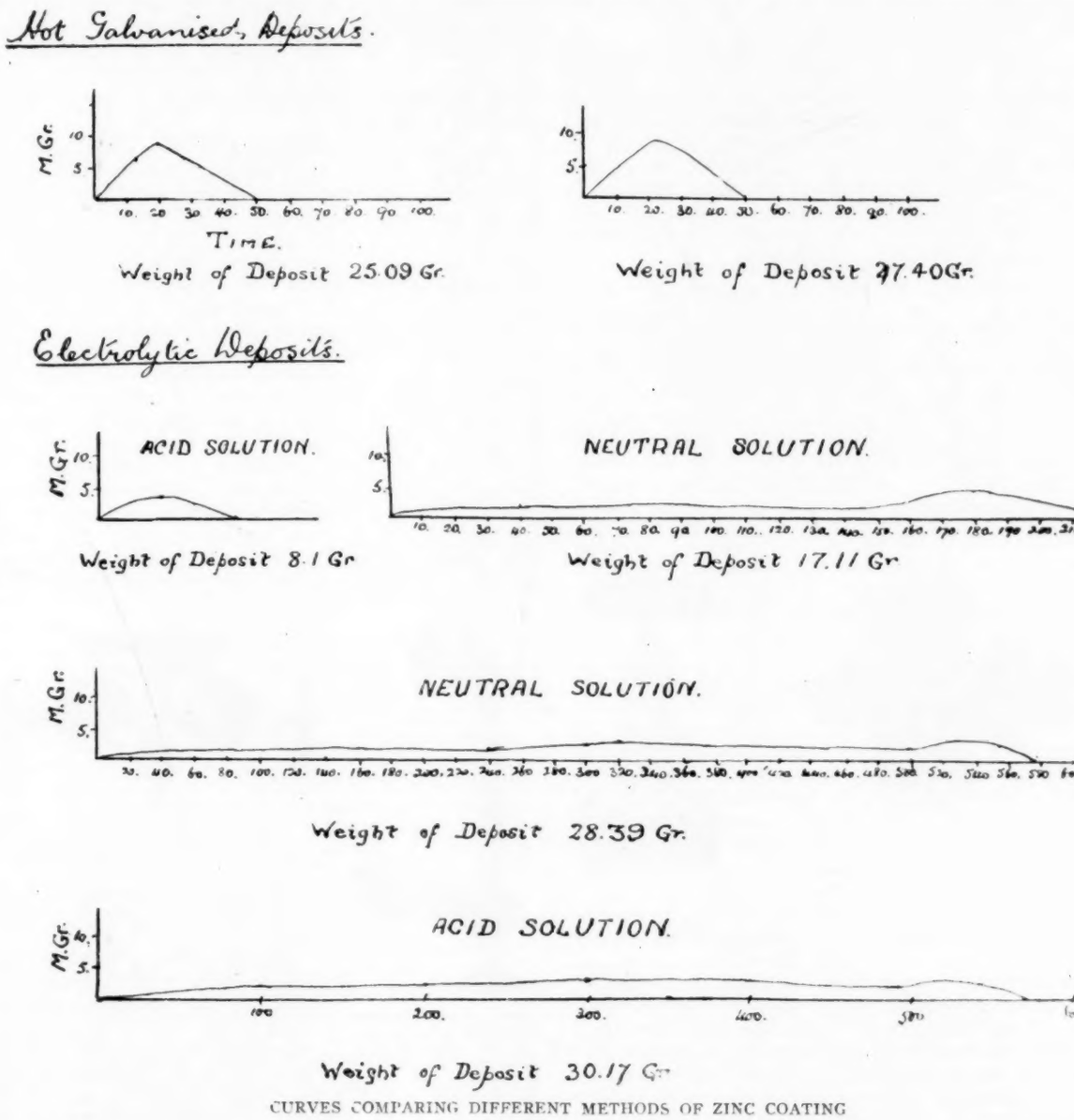
As to the electrolytes of zinc used for such work, I found it very essential to consider carefully the nature of the surface to be treated. For most purposes a simple zinc sulphate electrolyte rendered slightly acid by, say, boric acid, is quite satisfactory, but where deeply recessed surfaces required coating, and particularly where

*Some personal experiences of Mr. W. R. Barclay, as told to the Birmingham Section of the British Institute of Metals. For other articles on the same topic see Electro-Deposition as a Repairing Process, in THE METAL INDUSTRY, March, 1921, p. 117, and April, 1921, p. 159.

well-machined or highly polished parts for machinery were concerned, I thoroughly recommended a zinc cyanide solution of approximately the composition shown:

Zinc cyanide	12 ozs.
Potassium (or sodium) cyanide	10 ozs.
Caustic soda (NaOH)	4 ozs.
Water	1 gal.

It is well known that electro deposits from complex salts such as the double cyanides are of an appreciably finer grain and smaller crystals than those from solutions of simple salts. A comparison of deposits from solutions of the double cyanide of copper and potassium and from copper sulphate, respectively, illustrates this point very clearly, and the same thing applies to zinc. Zinc coatings from cyanide solutions are beautifully smooth and will take an exceedingly high polish. Further, such deposits under correct current conditions are very malleable and ductile. I may here just mention a very interesting problem which came before our Committee in connection with stainless steel. One firm, in order, I suppose, to make assurance double sure, wished to electro-plate stainless steel. They tried a number of metals, but found great difficulty in getting good adhesion. This problem came to me and I tried myself several solutions and found, somewhat to my surprise, that in the case of copper, silver and nickel adhesion was very poor; indeed, I hardly expected silver or nickel to adhere well, but I did expect to get a good result with copper. I happened, however, at the time to have a zinc cyanide solution at hand, and with this I obtained satisfactory results, though I am not aware that it has ever been adopted commercially.



CURVES COMPARING DIFFERENT METHODS OF ZINC COATING

Brazed Copper Sheets for Roofing

The Bureau of Standards tested recently some copper roofing sheets which had been brazed. The types of joints were "lock" joint and "lap" joint with the purpose of determining which type of joint was the stronger. It is interesting to note that the lap joint proved better. The brazed metal took a much longer time to flow into the lock joint, which caused over-heating and sometimes burning of the copper sheet. It was found that the lock joint was very much weaker and inferior.

It Is the Finish and Appearance That Make the Sale

A Description of the Effect of the Finish on the Market Value of Manufactured Articles*

By P. W. BLAIR, Mechanical Editor

The average individual, who makes a purchase of metal goods either in a hardware or jewelry store, generally has little, if any, knowledge of what and how they are made. In making a selection it is usually the novelty of the pattern or finish of the article that appeals to the purchaser and influences the sale.

Jobbers ask that articles they handle have the best possible finish and appearance, consistent with price, for it is their contention that "It is the finish and appearance that make the sale," And it is because cleaning methods and equipment play so large a part in preparing articles for the market that they are factors of extreme importance in the manufacture of practically all metal goods. In this connection, the chief elements to be taken into consideration are the cost of the process and the results obtained with the materials employed.

OLD VS. NEW METHODS AND MATERIALS

In the cleaning of metal parts and goods, both those in the course of manufacture and in the finishing operations, I have had considerable experience with the methods employed in the past. Previous to the introduction of high-speed steels and the use of automatic machines for the manufacture of metal parts, gasoline was one of the most common materials employed for cleaning and removing oil from parts. It was customary for every department of a manufacturing plant to have a certain amount of gasoline, in a special, covered receptacle, allotted to it at the starting of work each morning, all surplus or left-over gasoline being returned at the end of each day. Needless to say, owing to its very inflammable nature, it was a dangerous material to have around, no matter how carefully one might handle it, for sooner or later explosion or fire generally occurs. As a remover of surplus oils, greases, etc., on metal parts, gasoline has given good results. However, modern and non-inflammable cleaning solutions have displaced gasoline for cleaning, with a resultant doubling of production in the cleaning department.

FIG. 1. GROUND KEY STOP OF BRASS

FIG. 2. BRASS STEAM VALVE

Fig. 1 shows a high-grade, red brass, ground key stop. These stops are manufactured from a red brass or bronze alloy, the body being rough brass with a deep red-gold color. The hexes, body and patent cap receive a high machine finish. When the body castings are received in the machine shop, and before undergoing the machining and assembling operations, they have a very pleasing appearance. But when they get to the final stage of manufacture, they have, to a certain extent, lost it To restore this desired finish and bring back their red-golden luster, a cleaning operation is necessary. The cleaning solution may be either gasoline or a non-inflammable cleaning solution, used cold, in an especially constructed tank, the latter method to be used if it is a question of doubling production.

Fig. 2 shows a brass steam gate valve with a galvanized iron wheel. These valves are manufactured in sizes from one-quarter of an inch to three inches, inclusive, all parts being machined, assembled, tested and finally buffed. The finish of the main part or body of the valve is left just as it is in the rough casting, but when the trimmings are buffed, a black streak remains around the rough body which gives it a soiled appearance. To remove this, a method of cleaning was adopted by which the parts were immersed in a cleaning solution, used at boiling temperature, and then immersed in hot water for from ten to twenty seconds. The parts were then blown out with air, using a hose, at a pressure of eight pounds, which removed all surplus water inside the body of the valve, after which they were wiped off with a clean rag. This method gave the work a pleasing and uniform appearance and has made it possible to keep the company's trademarked products up to the highest standard. The method just referred to has also reduced the cost of finishing 75 per cent., as the operations are now performed by two girls where previously five, and sometimes six girls were necessary.

FIG. 3. BATHROOM WASTE AND OVERFLOW CONNECTION

FIG. 4. BATHROOM FIXTURE

Fig. 3 shows a finished bathroom waste and overflow connection, also compression double bath cock. The lavatory and bathroom fittings are manufactured in many different designs, all usually nickel-plated and highly finished. The process or method employed in a large plant in preparing work for the nickel-plating operation was to scrub the work by hand, using whitening lime as a cleaning compound. Boys did the work of scrubbing. Later, power-operated wheel brushes were used instead of the hand method. But now, with the introduction of a cleaning solution operated with current, the former method has been displaced and instead of the goods being color buffed, as heretofore, the heavy coating or buffing composition is left on and finally removed by the cleaning solution, used as an electric cleaner. Quite a lot of labor and time has thus been saved by this operation.

*One of the prize-winning essays in the 1920 contest of the Oakley Chemical Company.

Regulating Costs and Production

A Simple Method for Keeping a Check on the Production Records and Costs of a Factory

Written for The Metal Industry by FRANK ORRIN VANCE

The constant demand is for increased production. If an increased production is the solution of the problem of high costs, then it resolves itself into a question as to how best to regulate and stimulate production. The difficulties of the problem are greatly increased because very few manufacturers have a basis from which to start their efforts along this line.

The demand originates in many cases with a salesman who reports that he has a customer who is dissatisfied because he has not received his goods. This matter the salesman takes up with the factory manager, who in turn takes it up with the superintendent, who passes the complaint on to all of his foremen or perhaps only to those in charge of the departments through which this particular line of work passes.

To satisfy the demand operators are taken from other work and put on the goods that are called for. This results in an increased production of one line of goods, but in order to accomplish this the progress on the other goods has been stopped.

Now the effort had been started in good shape, the salesman had just cause for making a complaint; goods which he had sold had not been delivered and he had presented his case very strongly, but as the demand for an increase was passed along the line the effort lost force and by the time it reached the operator it was of little value.

If any good results at all are obtained through such efforts, they are at best temporary. The unsatisfactory results obtained were due to the fact that no one had a basis from which to work.

It is evident that in any effort to regulate production the first step must be to establish a unit of production. The quantity of work that can be produced or the number of operations that can be performed in each department under all possible conditions and by all classes of producers, speedy and slow, must be determined. The work tags from which the operators have been paid contain all the information necessary for the determining of such a unit. These records give the quantity produced or the quantity upon which an operation has been performed, and the time required to perform the operation on this quantity; the article number and name are also given.

The second step is to record this information in such a manner as to render the data available for use. For this purpose a special ruled card or loose leaf is used. At the top of the card space is provided for entering the department number or letter and the period under consideration, such as Department A, week ending Nov. 20, 1920. A column is provided for entering the article name and number which is headed "Article." In the second column, which is headed "Operation," is entered the kind of operation. Then a column is divided into three sections, the first section being headed "Quantity," the quantity produced being entered in it. The second section is headed "Hours" and in it is entered the time spent on the job. The third section is headed "Labor Cost," and under this heading is entered the labor cost of ths quantity. The column of three sections is continued across the card.

A card measuring fifteen inches across would allow for a binding edge, the columns headed Article and Operation and four of the three-section columns. In making the entries, the article, number and name would first be recorded; then the kind of operation, such as punching, trimming, etc., followed by the quantity, hours and labor cost. The records from each department are entered on separate sheets.

It is not necessary to use a separate column for each entry. Operations that are similar in nature and in the quantity produced in a given time are entered in the same column. The point is to have a record of the quantity, time and labor cost of operations which have points of similarity in each three-section column. For example, all operations of punching, if the articles punched were about the same size and there was little difference in the production, would be entered in one column. In this way all records as they are received from each department are entered on the sheet for its department. At the end of the week, when all the records have been received and recorded, the amounts are ruled off and totaled.

Although it may seem that with the completion of the work of entering and totaling, the records for the week, one was in a position to establish a unit of production, yet it is not so, for in a week's time it is not probable that every operation, that is, every performance in any one department, has been performed, and even if this had been done, the time would not have been sufficient to show the production under varying conditions and by different people. The records for a period of not less than three and preferably six months should be used. However, we assume that a sufficient period has elapsed, and that we have sufficient records to enable us to proceed.

We now add the totals of the quantity column, then the totals of the hours column and finally the totals of the labor cost column in order to ascertain the total number of operations performed, the total time spent performing the operations and the total labor costs. We now have a record of the number of operations performed as production units produced with the time it took to produce these units and the labor cost.

Assuming that the first use we wish to make of these records is the establishment of a piece work rate and that the operation upon which we wish to fix a price is punching, we would divide the total of the quantities entered in this column by the total number of hours and so determine a production for this operation per hour. If the total quantity punched was 50,000 and the total time was 50 hours, the production unit for one hour for this operation would be 1,000. If the amount which the operator should earn per hour is 35 cents and the piece work rate, to be established is to be per thousand, then the price would be thirty-five cents. Such a method of establishing piece work rates is perfectly fair for both employer and employee, because it is based, not on the production of the speediest or the slowest operator, but on the average production of a number of people under varying conditions.

Establishing piece work rates on an equitable basis, while it is important, is not the most valuable use that can be made of these records. We are now in a position to establish a unit of production for the entire department. If the total of all the parts produced in the department was 500,000 and the total of the hours was 1,000, the production unit for one hour would be 500. The next step is to establish an average hourly wage rate. This is done by dividing the total of all the labor cost for the period by the total of all the labor cost and it is found that the average

hourly wage paid was thirty-five cents, which is the hourly wage rate for the department.

All of this data is interesting, but its value lies in its use. In order that the foreman may know what he is expected to accomplish in maintaining an average hourly production, to give him a basis from which to work if he is to increase the production of his department, and so that he may know what the average hourly wage rate established for his department is, a weekly report is issued to him stating the hourly production rate established for his department. This hourly production rate remains the same until changed conditions would justify its increase or necessitate its reduction. The weekly report also states what his hourly production was for the preceding week. This would enable him to learn whether his department was exceeding or failing to attain the hourly production rate established. While the report is an essential part of the plan he would not depend entirely upon it for information in regard to the standing of his department, for his clerk would probably make a note daily of the production time spent on the various operations and of the labor cost.

The report also states the hourly wage rate established for his department and also states the hourly wage paid in his department during the preceding week. The hourly wage rate like the hourly production rate is not changed until changed conditions make it necessary.

The effect of the establishment of an hourly production rate and the issuing of weekly reports is that the foreman knows whether his department is producing the quantity of work that it is expected to produce. If asked to increase his production he knows that in order to do so his hourly production must exceed the established rate of 500 and he knows that his employers are acquainted with the results of his efforts. It insures a uniform rate of production with a tendency to increase it.

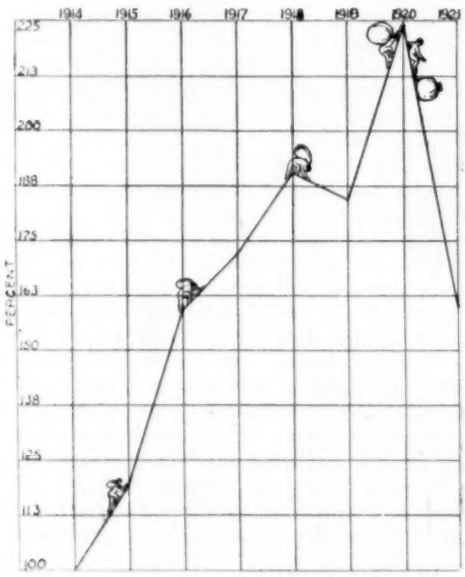
The effect of establishing an hourly wage rate is to give the foreman a basis from which to determine the wage rate he shall pay for day work, and for making piece work rates, keeping in mind that the average hourly wage paid in his department shall not exceed the established hourly rate. This does not mean that no one employee shall receive more than the established rate, for if his hourly rate is thirty-five cents, an experienced operator could be paid at the rate of forty-cents and another less skilled at thirty. It insures that the hourly wage rate paid in his department will not exceed the established rate.

The advantages of this plan are: It eliminates the necessity for making time studies; it establishes a fair basis for the making of piece work rates; it establishes an hourly wage rate; it insures that the established hourly wage rate shall not be exceeded; it establishes an hourly production rate.

The making of time studies even though made in the fairest manner possible and with the most honest of intentions is almost invariably a source of discontent. This plan supplies all the data necessary for the purpose for which time studies would be made and the figures obtained are more accurate.

Plating Supply Prices

The engineering department of Hanson & Van Winkle Company, Newark, has charted the price fluctuations in the plating supply trades as shown in the accompanying



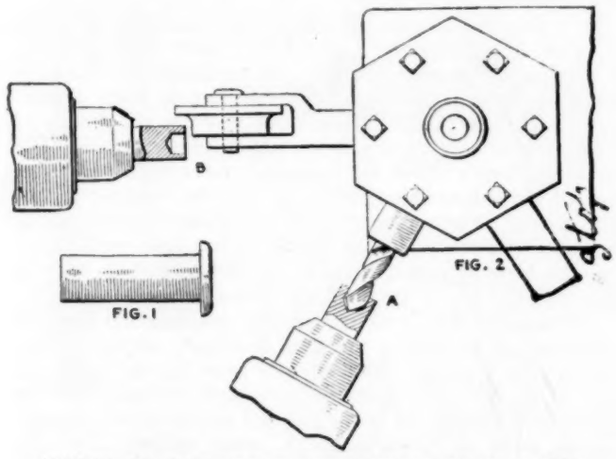
PLATING SUPPLY PRICE VARIATIONS

illustration. Among the items considered were buffs, polishing composition, polishing wheels, abrasive, nickel salts, cleaning compounds, chemicals and nickel anodes.

It is interesting to note that the drop from 1920 to 1921 is equal to the rise from 1916 to 1920. The decline from the highest figure in the latter six months' period is about 28 per cent., while some published statistics show a drop in the cost of living of only 17 per cent.

Making Brass Studs With Rolled Heads

Free turning brass rod of the diameter of the pin or stud body was used and the operations performed on 12 in. hand screw machine with rod feed attachment.



SKETCH OF OPERATIONS FOR MAKING BRASS STUDS

The first operation was to leave the stock extending from the collet ½ in. and drill a shallow hole in the end of stock as shown at A in Fig. 1 leaving the walls the desired thickness. The size and depth of the hole should be governed by the diameter of stock and the size of the head desired.

The second operation was to form the head by rolling, as shown at B. The wheel forming roller was made of tool steel hardened and 2 in. in diameter. After tempering, it was buffed up on buffing wheel, using Tripoli on the buff until scale and marks were removed. Holder was forging made from tool steel and with shank to fit hole in turret.

P. W. B.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

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ADVERTISING RATES ON APPLICATION FORMS CLOSE THE FIRST OF THE MONTH

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EDITORIAL

TARIFF AND TAXES

Two problems now stand out as of prime importance before the industrial world, namely tariff and taxation. The Fordney bill recently passed by the House with some changes which effect only indirectly the non-ferrous metal trades will shortly come up before the Senate for revision. There never has been such diversity of opinion in the matter of tariff as this bill has stirred up. On the one hand the advocates of the bill who include the stand-pat, old-time protectionists and the manufacturers whose product has been protected, claim that it is a great agency for prosperity and one without which our country will remain in the present depression. On the other hand free traders, believers in tariff for revenue only, bankers and those interested in foreign trade, and manufacturers whose raw materials have been covered by increased duty, are strong in their condemnation of the bill. Where the truth lies nobody can say with certainty as only a trial will tell.

However, in view of the fact that the law should operate for the greatest good of the greatest number, the consensus of opinion of manufacturers in various lines should be of value in forecasting the results of this bill. The questions which it brings up are, as stated in recent questions sent out by the Literary Digest.

1. Will the proposed new tariff schedules help your industry, restore prosperity and put the idle to work?

2. Will they raise or lower the cost of production in your field to the consumer, and thus raise or lower the cost of living?

We are very anxious to receive from our readers expressions of opinion about the tariff in general, and the Fordney bill in particular. So far, most of the communications we have received are against the increases as outlined in the above bill, but they have come from concerns interested in imports or from those whose raw materials have been taxed. What is the general opinion of the manufacturing interests of the metal trades?

As regards taxation. Four bills which aim to change the revenue law so as to relieve industry of one billion, seven hundred and thirty million dollars annually in taxation, and transfer this to the owners of unused land and inheritors of large fortunes were introduced in Congress by Representative Oscar E. Keller of Minnesota. These bills are sponsored by the Committee of Manufacturers and Merchants on Federal Taxation, of which Otto Cullman of Chicago, is the chairman, and which claims to have a membership of more than 31,000 substantial business firms in all parts of the United States.

The first bill repeals all existing transportation, stamp and sales taxes, except those on tobacco, distilled spirits, oleomargarine, habit forming drugs, and products of child labor. The bill also repeals the excess profits tax and the ten per cent. tax on the income of corporations.

The second bill amends the income tax, so as to distinguish between "earned" and "unearned" income. The present rates on "unearned" income together with the supertaxes are retained, but the taxes on "earned" incomes are cut in two.

The third bill increases the inheritance tax.

The fourth bill provides for a tax of one per cent. on land values in excess of $10,000 after exempting buildings and improvements, and in the case of farms, the cost of clearing, draining and maintenance of fertility. Owners of city homes are also exempted:*

According to the daily press the tendency in Washington at the present time seems to be to push the tax revision along with the tariff. With our enormous war debt and with the tremendous cost of keeping our military and naval establishments, the cost of government is growing to a point which would have been deemed unthinkable ten years ago. It seems to be generally accepted now, (at least in Washington) that the Government needs between 4 and 5 billion dollars per year. Is the present method of obtaining this money satisfactory? If not what are the alternatives? For a time it seemed as if the sales tax would take the place of a large part of the existing corporation and income taxes, but for the present at least, the sales tax idea is making no great headway. We should be glad to hear from our readers how these various taxes and alternatives affect their business.

LEAD POISONING

The report of the United States Public Health Service on lead poisoning in the pottery trades, contains certain recommendations, which will be found useful to metal manufacturers. So far, it seems that there is no certain preventative for lead poisoning. The best that can be done is to minimize the danger by means of sanitation and cleanliness.

Recommendations to workmen are as follows:

Always eat a good breakfast.

Drink milk.

Never eat or drink in the plant or workroom, and do not drink from uncovered containers kept in the workroom.

Never wear street clothing in the workroom.

Never take work clothes home, and keep the work clothes and the street clothes in separate sections of the locker.

While at work do not chew tobacco or gum.

Do not spit on the floor.

Do not wear a beard.

Do not stroke mustache with hands while at work (or do not wear a mustache) and do not put fingers in the mouth.

Keep hair covered while in the work room.

When quitting work for the day wash face and hands with hot water, clean finger nails and rinse out the mouth.

Avoid creating dust; only wet sweeping and dusting should be done.

The plant should be supplied with the following:

Bubbling fountains with good drinking water.

Adequate dressing rooms, with two compartment lockers for each workman.

Decent and adequate toilet facilities.

Sufficient natural and artificial illumination and ventilation.

Eating in the workroom should be prohibited, and eating anywhere else without previous washing of the hands and face should be strongly discouraged. The use of overalls should be recommended. All dry sweeping should be forbidden, and sweeping of any kind during the working hours should be discouraged.

Strict adherence to these rules will certainly minimize the danger of lead poisoning. Absolute immunity cannot be guaranteed, as this depends largely upon the susceptibility of the individual. However, until such time as medical science discovers further preventative methods, these rules should be obeyed to the letter.

*Complete information with regard to these bills can be obtained from Walter W. Liggett, care of the Committee of Manufacturers and Merchants on Federal Taxation, 233 Maryland Building, Washington, D. C.

CORRESPONDENCE AND DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

ENGINEERS' EMPLOYMENT BUREAU

To the Editor of THE METAL INDUSTRY:

The wide and varied field of engineering activity has created the need of some great clearing house of engineering services from which engineers of any specific qualifications may be obtained.

In recognition of this want, the Federated American Engineering Societies, representing a combined membership of about 50,000, including the best and most representative professional engineers in the United States, has established at 29 West 39th street, New York, an employment bureau for engineers of every variety of training and experience.

Applicants must be members, and submit a complete educational and professional record which is carefully classified, so that as the special requirements of any position are received, the records of men of suitable qualifications are submitted for consideration. The relatively large number of men with whom the bureau is in touch, the comprehensive classification of records, and the fact that the services of the Bureau are free to employer and member alike, renders possible the selection of the right man for the service required. Negotiations may be confidential if desired.

The high standards required for membership in any of the member societies insure the quality of men available, and the bureau will welcome inquiries from those seeking to build up or expand their engineering organizations in preparation for the increased activity now manifest.

FEDERATED AMERICAN ENGINEERING SOCIETIES.

New York, July 20, 1921.

ALUMINIUM ALLOYS

To the Editor of THE METAL INDUSTRY:

Referring to the inquiry on page 295 of your July issue.

Your correspondent evidently has in mind the Navy Department Alloy No. 49-A-1 which comprises Aluminium-Copper and Manganese with a certain allowance for the necessary Iron and Silicon impurities. It would certainly not seem to be necessary to add these last mentioned elements as your answer suggests, because they would be present anyway, although probably not quite so high as the figures given which are maxima.

The elongation quoted, 15%, seems rather high and on reference to specification No. 49-A-1, we find the figure printed as 8%. Is it possible that there is some error here? So far as I have been able to ascertain from researches of Rosenhain and Lantsberry on this group of alloys, they did not achieve anything like so high as a 15% elongation on this mixture, even working under very carefully supervised laboratory conditions, and 8% would be much more practical.

ERNEST V. PANNELL.

New York, July 15, 1921.

NEW BOOKS

Journal of the Institute of Metals. Edited by G. Shaw Scott, M. Sc., Secretary. Published by the Institute of Metals, London, England.

This is volume 25 of the Journal of the Institute of Metals. The book contains, in addition to the minutes of the proceedings and abstracts of papers relating to non-ferrous metals and the industries connected therewith, a number of papers, presented at Institute meetings, abstracts of which will be found in back numbers of THE METAL INDUSTRY. These papers are as follows:

The Season Cracking of Brass and Other Copper Alloys.

Some Notes on Calcium.

Plastic Deformation of Some Copper Alloys at Elevated Temperatures.

The Action of Reducing Gases on Heated Copper.

Stages in the Recrystallization of Aluminum Sheet on Heating, With a Note on the Birth of Crystals in Strained Metals and Alloys.

The Constitution of the Alloys of Copper with Tin, Parts III and IV.

Note on "The Application of the Scleroscope to the Determination of the Hardness of Thin Brass Strip."

Transactions of the American Foundrymen's Association. Edited by Earl S. Shaner, and published by the American Foundrymen's Association, Chicago, Ill.

This is volume 29 of the Transactions of the A. F. A., which includes reports, papers read and discussions at the 25th annual meeting at Columbus, Ohio, October 4 to 8, 1920. A number of these papers in full and in abstract can be found in the back numbers of THE METAL INDUSTRY.

Papers of interest to the metal industries are as follows:

Casting Losses in Aluminum Foundry Practice.

The Relation of Die-Casting to Foundry Practice.

An Improved Electric Brass Melting Furnace.

Carborundum Refractories in Non-Ferrous Metallurgy.

Pouring Temperatures as Affecting Casting Shrinkage and Solidity.

Producing Small Non-Ferrous Castings.

Present Status of the Electric Non-Ferrous Industry with Special Reference to the Foundry.

The American Foundrymen's Association has also published a most useful volume, an Index of the Transactions, covering the contents of volumes 9 to 29 inclusive. This volume is thoroughly cross-indexed and includes also a list of authors with their publications. The association is to be congratulated on the publication of such a worth while index, which will so greatly aid searches into foundry literature.

GOVERNMENT PUBLICATIONS

Silver, Copper, Lead and Zinc in the Central States in 1919.—By J. P. Dunlop, U. S. Geological Survey, Washington, D. C.

Lead Smelting and Refining.—Census Bureau's Summary Concerning the Industry—1919. Bureau of the Census, Washington, D. C.

Copper Smelting and Refining.—Census Bureau's Summary Concerning the Industry—1919. Bureau of the Census, Washington, D. C.

Antimony in 1919.—By Frank C. Schrader. U. S. Geological Survey, Washington, D. C.

Manufacture of Brass, Bronze and Copper Products.—Census Bureau's Summary Concerning the Industry—1919. Bureau of the Census, Washington, D. C.

Ammunition, Firearms and Ordnance.—Census Bureau's Summary Concerning the Industries—1919. Bureau of the Census, Washington, D. C.

Secondary Metals Recovered in 1920.—U. S. Geological Survey, Washington, D. C.

Mineral Resources of the United States in 1920.—Statistics assembled by Martha B. Clark, Introduction by G. F. Loughlin, U. S. Geological Survey, Washington, D. C.

Laboratory Studies of the Trent Process.—By G. St. J. Perrott, Associate Physical Chemist; and S. P. Kinney, Assistant Metallurgical Chemist. Reports of Investigations, Serial No. 2263. U. S. Bureau of Mines, Washington, D. C.

Lead and Zinc Pigments Marketed in the United States, 1919-1920.—U. S. Geological Survey, Washington, D. C.

Advance Statement of the Production of Copper in the United States in 1920.—By H. A. C. Jenison, U. S. Geological Survey, Washington, D. C.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research }

BLACK VARNISH

Q.—I have some job rings which I have to finish in two colors, and the lacquer and shellac I use when I get one of the colors does not stay on when I put them in a hot gold solution. Would you kindly inform me which is the best kind of lacquer to use for this kind of work.

A.—Air-drying black asphaltum varnish is principally used by gold colorers for painting-out, when two color work is to be done.

You can prepare a varnish yourself. Dissolve Egyptian asphaltum in spirits of turpentine by the aid of heat, so that on cooling a varnish results that can be readily applied with a pencil brush.

Gum Ginacum varnish is also an excellent material for stopping-off purposes. Dissolve the gum in alcohol or acetone by the aid of heat (preferably a hot water bath) until a varnish is produced. It is advisable to color it a little with aniline blue or violet. The varnish is more distinguishable when colored.

The asphaltum or ginacum can be readily removed with their respective solvents.—C. H. P. Problem 2,974.

BRAZING MATERIAL

Q.—We would like information as to the proper brazing material to be used for brazing of steel, brass and bronze as used in aero construction.

A.—The alloys or "spelters" used for brazing steel, brass and bronze are composed of copper-zinc alloys. The fusing point of the spelter should be as close as possible to that of the article to be brazed, as a more tenacious joint is thereby secured.

Composition of brazing alloys:

Metals to Be Brazed	Flux	Hard Copper	Solder Zinc
Brass, soft	Borax	22	78
Bronze	Borax	45	55
Iron and steel	Borax	64	36
Cast iron	Cuprous oxide	55	45

—P. W. B. Problem 2,975.

BRONZE FROM BRASS BALL

Q.—How can I get my old brass solution to plate darker, say to a light bronze?

A.—If you want to use an old brass solution to give you a light bronze plate, it would be advisable to heat up the solution to 140 deg. or 160 deg. Fahr. Then add about an ounce of sodium cyanide per gallon and enough bisulphite of soda to bring up the color. It may take one ounce or it may take three ounces.

If the brass color still persists, then it will be advisable to reduce the brass solution to 50 per cent. with water. Then add 1 ounce of copper cyanide dissolved in 1 ounce of sodium cyanide for each gallon of solution, using as little hot water as possible to dissolve the materials.

Heat and cyanide and sodium bisulphite should give you the results you desire.—C. H. P. Problem 2,976.

BUFFING SILVER

Q.—We are having trouble with our reflectors (automobile) and try as we will we cannot overcome it. Coming from the silver bath they look good; no scratches at all, but when I finish buffing they are covered with small scratches. I have used cotton flannel buffs, muslin, in fact everything I heard of. Have used high and low speed lathes, used crocus white finish and lamp blank, but without effect. I keep my buffs well cleaned. Also tried alcohol and coal oil but no good.

A.—It would seem to us that the scratches that cause you so much trouble must be in the reflectors before silver plating. Surely with all the care you use after the reflectors have been silver plated your finishing operations should not produce the scratches as noted. An ordinarily soft buff, well cleaned and run at 3,000 per minute with alcohol and jewelers' powdered rouge as the polishing medium, should give a finish that has all that is desired for automobile reflectors. The operations for plating and finishing brass reflectors should be as follows:

1st. Cut with tripoli and color to a high finish.
2nd. Cleanse and nickel plate for five minutes.
3rd. Strike in the regular silver strike.
4th. Silver plate long enough so that a clear high lustre will result by buffing as outlined.

The hardness of the silver can be increased by adding nickel cyanide to the silver solution, about 1 to 2 ounces dissolved in an equal amount of sodium cyanide, using as little hot water as possible for dissolving and added proportionately to each gallon of silver solution.—C. H. P. Problem 2,977.

CASTING HOLLOW HEMISPHERES

Q.—I want to cast four hemispheres 20 inches in diameter with the shell ⅜ inch thick. These hemispheres are to be made up into perfect spheres for a spark gap to be used in measuring high tension voltage. It is desired to find an alloy such as brass which will give a perfect casting without the slightest pin holes which can be readily machined and sufficiently hard to take a polish and not easily scratch. In order to obtain non-arcing qualities it is desirable to have an alloy containing at least 50% zinc. Electrical conductivity is no object. If you know of an alloy meeting such specifications, we will greatly appreciate it.

A.—The alloys of copper and zinc that contain in excess of 50% of zinc are hard and brittle. They cannot for this reason be used in the commercial production of castings. The maximum percentage of zinc in any practicable foundry alloy is about 42% in the alloy known as manganese bronze. This alloy has a Brinell hardness of about 100 (or about double that of ordinary cast brass), hence it will take a good polish and not be easily scratched.

As the poles of the hemispheres are the spots that must be essentially perfect, the average founder no doubt prefers to cast them upside down, gating them at the top edge and extending this edge several inches, so that it will serve as a riser, being cut off in the subsequent machining operations.

The writer, however, prefers to cast the hemispheres with the open side down, in a three part flask, gating them in the cheek, half way between the drag and the cope and pouring them with a "well." Hollow ware castings are molded successfully in this position.

Common yellow brass is often used for casting these hemispheres. Where pin-holes occur they may be riveted up using plugs cast from the same alloy. The hemispheres are also spun from sheet copper or sheet brass.

Where one meter or larger diameter hemispheres are made an equal amount should be machined from both inside and outside of the castings, so as to prevent warping due to the relief of casting stresses.—J. L. J. Problem 2,978.

CLEANING ALUMINUM

Q.—We are having great trouble in cleaning our aluminum castings which we enamel black, and are compelled to bake them three times before we obtain a coat covering entirely these castings.

We certainly would appreciate very much if you could suggest something to wash said castings before enameling and what enamel is best to employ.

A.—The most satisfactory manner, in which to obtain a perfectly clean aluminum casting for enameling purposes, is as follows:

1st. Prepare an alkaline cleaner as follows:

Hot water	1 gallon
Soda Ash, 58%	4 ozs.
Caustic Soda	4 "
Sodium Cyanide	½ "

Prepare the cleaner in an iron kettle and maintain the temperature at not less than 200 degrees Fahr.

After cleansing the castings wash thoroughly in cold and boiling water, dry out and apply your enamels and note results.

No. 2. If the enamel does not adhere properly, then we would suggest following the cleansing and washing operations, by immersing the castings in an acid dip prepared as follows:

Nitric Acid	2 gallons
Sulphuric Acid	1 gallon

Wash thoroughly and dry as outlined and the enamel as usual. Sand-blasting is also an efficient method for cleansing aluminum. Some firms claim the enamel clings better to a sandblasted surface. Others give the aluminum a darkened surface after cleansing by an immersion in a hot arsenic dip. The dip eliminates at least one coat of enamel.

Formula for arsenic dip.

Water	1 gallon
Sodium Cyanide	1½ ozs.
Caustic Soda	4½ "
White Powdered Arsenic	2¼ "

The solution should be hot, not less than 180 to 200 degrees Fahr. Following the arsenic dip, wash, dry and enamel one or two cents.—C. H. P. Problem 2,979.

DRY TUMBLE POLISHING

Q.—Do you know a dry tumble polishing method which is as good, or will give as good results as the burnishing process? In our work copper is being used, and it is our desire to obtain a high polish copper finish equivalent to a buff.

A.—One of the best materials to use in dry tumbling, when replacing the wet method of ball burnishing for copper, nickel or brass, is sole leather clippings. Sufficient clippings should be used so that the articles to be polished by tumbling in the oblique tumbling barrel will tumble freely without abrasion.

For the polishing medium, white polishing composition, reduced to a powder and then mixed to a fluid paste with gasoline, should be used. A little kerosene should be added to prevent the gasoline evaporating too rapidly.

Use just as little as possible of the mixture to give the desired results. At a speed of rotation of 40 to 60 per minute the articles should acquire a sufficient lustre in 20 to 30 minutes.—C. H. P. Problem 2,980.

OXIDATION IN MELTING

Q.—The writer has recently been up against a problem which has been a rather difficult one for us to solve, and here is the dope.

The casting to be made is a pump plunger, to be cast from a mixture of copper, 88; tin, 10; lead, 2, which the parties term an acid metal. Zinc content is not permitted. The casting is 5½ inches in diameter and about 4 feet long.

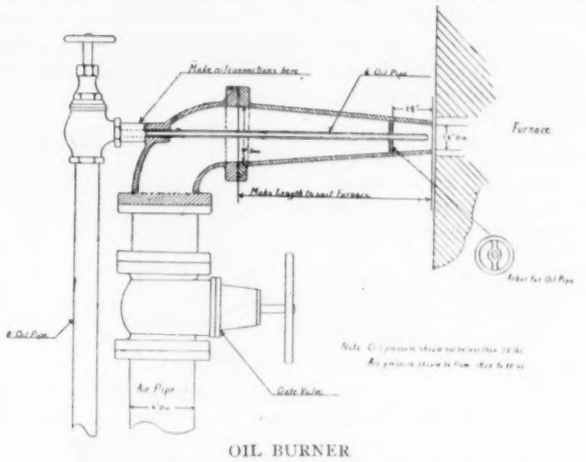
I have tried for three consecutive days to pour a successful casting, but have failed. The trouble seems to be a generation of gases in the metal which cause the gates and risers to bulge upward. This, of course, is an indication of a porous casting; this is shown when the casting is machined. The outside of the casting is perfect, but under the skin it is pitted.

We are melting the metal in our oil furnace, and when ready to pour the metal looks fine. We have tried various temperatures, but this does not seem to change the conditions much. We have used charcoal as a covering, and borax as a flux; also have used flaked boric acid as flux, and in all cases have used phosphor copper as a cleanser, but the result is always the same.

A.—The difficulty in this case is due to the improper operation of the furnace which results in the metal being badly oxidized. When the metal bulges upward in the gates and risers, the difficulty may be aggravated by the design of the furnace; this point should be carefully investigated.

I was called to a plant a few days ago to give some advice as to what was the cause of a condition similar to yours. The thought occurred to me since I visited this plant that the trouble with the furnace is in the burner, for as I watched the men operate this furnace I could not find any fault with the operator, and still the castings were porous, and the cause was oxidized metal. How does this metal become oxidized? I have operated open-flame furnaces for years and never saw such castings as I had inspected.

Here are some of the suggestions I would make in checking up the cause of the oxidization: First, I would see that I had at least 18 ounces of air pressure, 25 pounds of oil pressure, and proper valves on the air line (not slides in a tin pipe, but a gate



OIL BURNER

valve in an iron pipe), and enough oil used to form a perfect combination of the oil and air.

These were the conditions I found at the plant I visited, and possibly this is the same condition you have. The whole secret is to have enough oil and air for perfect combustion.—W. J. R. Problem 2,981.

LEATHER ON COPPER

Q.—We are covering some articles made of copper with seal leather. We find after a certain time, this copper develops verdigris and the leather peels off from the article.

We have used various glues, but each gives the same result. Could you kindly tell us of some special glue or shellac that would adhere permanently to the copper or could you suggest any treatment of the copper that would prevent the verdigris forming, which seems to be the reason why the glue in time loses its adhering qualities?

A.—It is possible that mineral glue (sodium silicate) will answer the purpose. This is an adhesive that is used extensively at present. Apply cold just as you would glue.

Shellac is also an important adhesive for leather, etc. A heavy solution of orange shellac dissolved in denatured alcohol, will give the results desired.

It is possible that a thin coating of shellac applied first to the copper and then when hard applying the glue would overcome the difficulties outlined.—C. H. P. Problem 2,982.

PISTON RINGS

Q.—We are having considerable trouble in making piston rings of the following mixture: Copper, 82%; tin, 12%; zinc, 3%; phosphor tin, 3%; the latter carries 3.5% phosphorus.

We lose about 75% of these rings. They are about ⅛" wide and ⅛" thick; they are turned down from a stock pattern 1½" in diameter, with a 1" core 12" long, and are compressed in the machine shop. The castings show up brittle in the machining, and often break in pieces.

What should the analysis show for this mixture? Our chemist claims the phosphorus is 0.08%.

A.—The alloy used for piston rings that gives very good results consists of:

Copper	82
Tin	17½
Phosphor copper, 15%	½

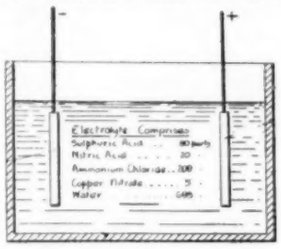
This metal is very hard and brittle, but is handled as follows: After casting and knocking off the gates and cleaning, heat to a dull red, and cleanse in water. If handled properly this mixture makes a tough and good piston ring metal. It is the alloy used in air brake work.

The mixture you are using would also improve by this process. However, the mixture given will give you the desired results. The analysis of this mixture should not vary 1% from the mixture as charged in furnace.—W. J. R. Problem 2,983.

PATENTS

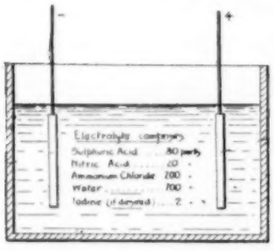
A REVIEW OF CURRENT PATENTS OF INTEREST

1,376,367. April 26, 1921. **Solution or Bath for Use in Electrically Preparing Stencil-Plates, Die-Plates and the Like.** Gotthold E. Wertheimer, of Astoria, N. Y.



This invention relates to a composition of matter adapted to be used as the solution or bath in connection with a process of preparing metallic stencil plates or die plates or blocks or like articles, involving the erosion or eating away of certain parts of such plates by the use of electric current in conjunction with said solution or bath.

1,376,366. April 26, 1921. **Solution or Bath for Use in Electrically Preparing Stencil-Plates, Die-Plates and the Like.** Gotthold E. Wertheimer, New York, N. Y.



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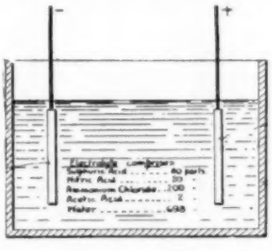
1,376,368. April 26, 1921. **Solution or Bath for Use in Electrically Preparing Stencil-Plates, Die-Plates and the Like.** Gotthold E. Wertheimer, of Astoria, N. Y.



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1,375,804. April 26, 1921. **Alloy.** Columbus D. Stovall, of Lexington, Kentucky.

This invention relates to certain improvements in alloys and has relation more particularly to an alloy especially designed and adapted for use in connection with dentistry, and it is an object of the invention to provide a novel and improved alloy which is substantially non-oxidizable, hard, elastic and tenacious.

The improved alloy comprises the following ingredients mixed in substantially the proportions given:

Gold	72 grains.
Nickel	13½ grains.
Copper	16½ grains.

1,376,052. April 26, 1921. **Metal Alloy.** John F. Wandersee, of Highland Park, Robert Peretto, of Detroit, and Theodore A. L. Albrecht, of Royal Oak, Michigan, assignors to Ford Motor Company, of Detroit, Mich., a corporation of Michigan.

As the main constituents of our alloy we prefer carbon, chromium, tungsten and cobalt. The presence of iron in an amount up to fifteen per cent., together with these constituents, will also make an excellent alloy for the production of such tools as herein specified.

1,376,339. April 26, 1921. **Bearing Metal.** James G. Kelly, Albert L. Pringle, and Holmes Hall, of Sedalia, Mo.

This invention consists of a bearing metal composed of zinc, aluminum, tin, and lead, which compositions is very close-grained and very tough and has enduring qualities and when turned, bored, planed, filed, or scraped will have a very smooth surface and withstand very heavy pressure at a very high rate of speed and which wears away very slowly.

1,377,089. May 3, 1921. **Alloy.** Foster Milliken, of Lawrence, N. Y., assignor to Foster Milliken, S. Fullerton Weaver, and James M. Repplier, trustees.

The object of the invention is to provide a new and improved alloy characterized by a high resistance to the corrosive influences of acids and capable of withstanding high temperatures.

The alloy contains the following metals in substantially the following proportions, namely:

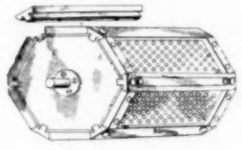
	Per cent.
Copper	45–55
Nickel	29–35
Lead	1–3
Zinc	5–9
Iron	4–8
Silicon copper (approximately 10%)	1–3

1,375,672. April 26, 1921. **Acid-Resisting Alloy.** Alvah W. Clement, of Cleveland, Ohio, assignor to the Cleveland Brass Manufacturing Company, of Cleveland, Ohio, a corporation of Ohio.

This invention relates to metal alloys, and seeks to provide an alloy of metals, which alloy shall be highly resistant to acid, particularly nitric acid, even though the acid be in a hot dilute condition.

The alloy herein proposed, consists substantially of chromium, iron and carbon in the proportion of substantially 60 per cent. of chromium, substantially 2 to 5 per cent. of carbon, substantially 2 to 4 per cent. of silicon, and the remainder of iron.

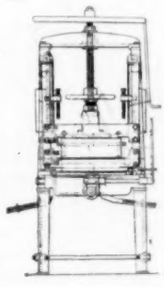
1,377,155. May 3, 1921. **Electroplating Barrel.** Forest H. Hartzell, of Dayton, Ohio.



This invention relates to electroplating apparatus and more particularly to that type of apparatus employing a revolving barrel or drum in which the articles to be plated are tumbled and which is suspended in a tank or vat of electrolytic solution.

The object of the invention is to improve the structure as well as the means and mode of operation of such devices whereby they will not only be cheapened in construction, but will be more efficient in use, positive in operation, economical, and unlikely to get out of repair.

1,376,661. May 3, 1921. **Machine for Casting Metals.** Charles Edward West, of Higham Hill, Walthamstow, England.



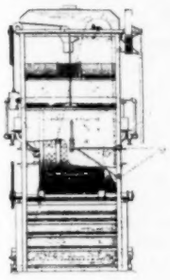
This invention relates to die casting machines of the kind in which coacting dies or molds are capable of movement to and from a container positioned beneath them, and from which molten metal can be forced into the dies which are positioned one above the other and in which the molten metal is forced upwardly by a plunger, through an opening in the lower die.

1,376,680. May 3, 1921. **Metallurgical Furnace.** Frank C. Curtis, of Troy, N. Y.

This invention relates to metallurgical furnaces adapted for the burning of fluid-fuel, such as gas or oil.

The principal objects of the invention are to effectively use the fluid-fuel, and to facilitate the repair and reconstruction of the furnace.

1,377,993. May 10, 1921. **Sand-Blast Machine.** Elmer A. Rich, Jr., of Chicago, Illinois, assignor to the American Foundry Equipment Company, of New York, N. Y., a corporation of Ohio.



Prominent objects of the invention are to provide a simple, practical and effective sand-blast machine; to arrange for the easy and ready introduction of the articles to be treated into the machine, also the ready, quick and convenient removal of said articles from the same; to arrange for the economical use of the sand by automatically returning the same after use into position to be used again; to arrange for the effective treatment of the articles within the machine so that such treatment will be efficient and even over all portions of the articles; and to accomplish the foregoing and other desirable results in a simple and expeditious manner.

1,377,406. May 10, 1921. **Rotary Casting.** Dimitri Sensaud de Lavaud, of New York, N. Y.

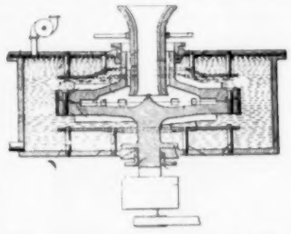
The invention provides a distributer lining for the hollow part of the distributer within which the metal is temporarily confined preparatory to casting an annular object, as a pipe, or through which the molten metal steadily flows during the casting of such a pipe. The tilting trough, as an example of the former type of distributer, is well known in the art; and an example of the latter type of distributer is a spout such as disclosed in United States Letters Patent No. 1,329,295 issued to the undersigned.

1,377,217. May 10, 1921. **Process of Recovering Metallic Constituents from a Mixture Thereof.** George W. Mullen, of Elmhurst, N. Y., assignor to Howard B. Bishop, of Summit, N. J.

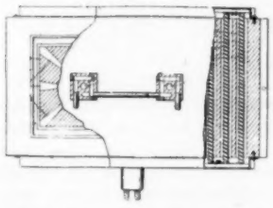
The process relates more particularly to the art of separating the metallic constituents from white metal mattes, although of course it is equally applicable to equivalent starting material. The matte from white metal smelters contains appreciable amounts of tin, copper and lead, as well as antimony and also the usual impurities. Such matte, known as white matte, contains the metals as metals, whereas black matte, although also containing the metals, does not contain them in the metallic state.

1,377,226. May 10, 1921. **Method and Apparatus for Pressure Die-Casting.** Earl H. Sherbondy, of Cleveland, Ohio.

This invention relates to a method of and apparatus for casting any kind of molten material, such as ordinary metals, as well as other materials which are susceptible of being cast, such as bakelite. More particularly the invention comprises a method and means of pressure die casting, that is to say, one in which the metal is projected into and held in the die under pressure, until it is sufficiently cool to be removed.



1,378,984. May 24, 1921. **Method of and Apparatus for Making Die-Castings.** Joseph Soss, of New York, N. Y.

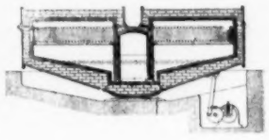


This invention relates to the making of die castings of various kinds and classes and particularly large castings of this class, and the object of the invention is to provide an electric heating element or elements which are employed in connection with the dies or molds for the purpose of heating such dies or molds, or keeping the same at an even degree of heat when the same are in use.

1,377,982. May 10, 1921. **Manufacture of Molybdenum-Tungsten Alloy.** Frederick G. Keyes, of Cambridge, Mass., assignor to Cooper Hewitt Electric Company, a corporation of New Jersey.

The present invention relates to a new method of producing an alloy of tungsten and molybdenum containing any desired percentage of the last named element. Such an alloy may be used for a great variety of purposes and it is not the intention of the patentee to describe it in such a way as to confine its use necessarily to any particular art. In order, however, to point out one important use of this alloy, it shall with the reservation above made be described as suited to the purposes of making lamp filaments or resistance wire for electric tube furnaces.

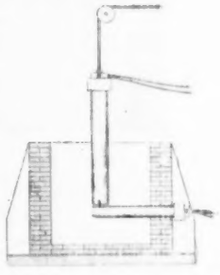
1,378,526. May 17, 1921. **Melting-Furnace.** Edgar F. Collins, of Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.



The present invention comprises an electric furnace which is particularly well adapted for the melting of easily fusible metals, such, for example, as zinc.

One of the objects of this invention is to provide a furnace in which metal bodies to be melted are subjected to the washing action of metal already molten; another object of this invention is to provide means for separating dross from the molten metal.

1,379,523. May 24, 1921. **Process of Reducing Aluminum Oxid.** Louis Burgess, of New York, N. Y., assignor to Standard Oil Company, a corporation of New Jersey.



This invention relates to new and useful improvements in processes for the reduction of aluminum oxid, either pure or mixed, or combined with other substances, as for example, the crude ore of aluminum, bauxite. The invention particularly contemplates the treatment of the material described, in order to reduce the same to alumino metallic alloys, combinations of alloys with aluminum carbid, and aluminum carbid with or without percentages of aluminum metal.

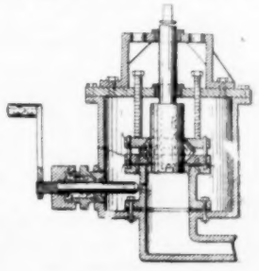
1,378,996. May 24, 1921. **Alloy.** Frederic E. Carter, of Newark, N. J., assignor to Baker and Company, Inc., a corporation of New Jersey.

This invention relates more particularly to an alloy to replace platinum-iridium, as it is employed for hypodermic needles, magneto contacts and the like, and the objects of the invention are to avoid the use of iridium, which is expensive and difficult to obtain; to obtain an alloy which shall closely simulate platinum-iridium in all the qualities which render it especially adapted to the uses for which it is employed; to obtain a practicable facility in working the alloy.

In carrying out this invention an alloy of gold and palladium with an excess of platinum is formed, by fusing or melting them together, and the proportions of such metals which are used are substantially ½%-5% of palladium and 5%-15% of gold, the rest of the alloy being platinum.

1,377,604. May 10, 1921. **Die-Casting Machine.** Percy L. Sibole, of Swissvale, Pa.

This invention relates to die-casting machines.



The object of this invention is to provide a die-casting machine in which the plunger or piston cannot become "frozen" or stuck to the wall of the cylinder in which it works, and to overcome the loss of pressure due to leaky pistons. Other objects appear hereinafter.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Calorizing

The Process for Protecting Metals from Oxidation at High Temperatures; Recent Developments in This Large and Constantly Growing Field

By ROBERT JUNE, Mechanical Engineer, Detroit

Since the beginning of the use of ferrous metals, the outstanding difficulty that has been experienced by users is that of oxidation. The most common indication of this trouble is the effect of moisture on the metal, commonly known as rusting. Another form is the destruction of the metal while being subjected to high temperatures in boilers, furnaces, retorts, etc. Manufacturers of equipment that had to be used where the action of the heat decomposed the metal have given this subject long and earnest study, and a number of methods of overcoming this difficulty have been introduced.

A very successful process of treatment that has been developed

FIG. 1. MICRO-PHOTOGRAPH SHOWING CROSS SECTION OF CALORIZED STEEL TUBING

is known as calorizing, which was discovered in 1911 by the General Electric Company in their experimental laboratory. This method consists of heating metals in stationary or rotary retorts with a mixture containing finely divided aluminum. The treatment, conducted at high temperature, so thoroughly infuses aluminum into the exposed portion of the metal to be treated that it forms a homogeneous alloy in depth from a few thousandths of an inch to the permeation of the entire mass, depending on the length of treatment. The advantage of this process over the others is that the protective element is not put on in the form of a skin, but enters into intimate association with it, forming a solid mass. This makes a comparatively smooth surface.

Wrought iron, malleable iron, steel, nickel, nickel steel, copper, brass, etc., may be calorized with excellent results. When brass or copper are treated by this process, they show a resistance to the destructive action of certain gases and acids. However, the calorizing process will not prevent atmospheric oxidation, or rust, from moisture.

Calorized iron will withstand temperatures of 1,800 deg. F., whereas untreated metal begins to oxidize noticeably at 1,100 deg., and at 1,800 deg. F. its disintegration is extremely rapid. Gases containing sulphur dioxide and carbon monoxide, which have a extremely deleterious effect on metal, do not affect metal which has been calorized.

Calorizing has been put to a great variety of uses, including its application to carbonizing and annealing boxes, pyrometer tubes, furnace castings, tubes for preheating air, flue lining, pipe for conveying molten glass, blast furnace tuyeres, soot blowers for boilers, etc. The use of Diesel engines is increasing rapidly and the calorizing of valve heads and other parts of this engine that are subjected to high temperatures is a factor that will contribute in no little measure to the successful commercial use of such engines.

It is entirely possible to make up calorized pipe coils in a wide variety of shapes, lengths and sizes. Straight pipe 1.8 to 18 inches in diameter has been calorized in lengths up to 20 feet. Calorized steel is particularly adaptable to pyrometer tubes because of the high temperatures to which they are exposed. It is cheaper than the chrome steel alloys used for this purpose and it possesses the advantages of greater uniformity of strength of material due to the superiority of the wrought steel type over the cast steel. Special shapes can be bent from standard tubing, either before or after calorizing, eliminating the expense of special castings.

Many furnaces, ovens and retorts employed in various manufacturing processes were originally made of iron or steel. This metal was reduced to scrap in a comparatively short time, due to its limited heat resisting qualities. This necessitated frequent replacements, and as the price of labor and metal increased, other materials for this use were considered. The result was the construction of these furnaces from fire brick and various refractive materials. The use of this material was the cause of a loss of from 25 to 75 per cent. in efficiency, but they were adopted nevertheless on account of the labor and replacement expense of iron and steel being almost prohibitive. When the calorizing process is applied to these furnaces, the cost per unit of service is a great deal less than that of refractive materials and the efficiency of the equipment is considerably higher. In the application of this process to the various equipment used in heat treating, there is a wide field. Many users find that the length of life of the calorized units is in some cases over eight times that of equipment which has not been so treated.

The physical characteristics of metal calorized are not changed, except the accomplishment of a slight anneal, which is the result of the temperature of the furnace during the process. The expansion and contraction, and also the tensile strength of the metal, is the same as before being calorized.

In the past few years great advances have been made in the art of calorizing soot blower units to protect them from oxidation at high temperatures. The Diamond Power Specialty Company, of Detroit, Mich., has spent over $100,000 in bringing its calorizing plant to a high state of efficiency. While calorizing was new, a great deal of experimental work had to be carried on to develop just the right type of furnace and just the right methods for conducting the process. Today, calorizing is standardized, the operations being carried out upon predetermined schedules,

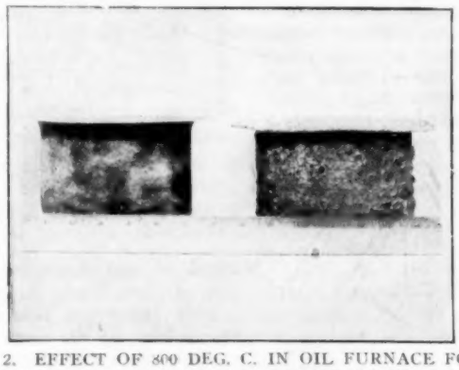


FIG. 2. EFFECT OF 800 DEG. C. IN OIL FURNACE FOR 100 HOURS ON CALORIZED AND UNCALORIZED SHEET IRON SHELLS

and with the aid of a chemical laboratory and complete batteries of recording instruments, so that absolutely uniform, high standard work is produced.

Calorizing has completely fulfilled its early promise of solving many difficult soot blower problems. Calorized soot blower units are now in use on several million horsepower boilers, fulfilling their functions satisfactorily in all respects. Calorizing has made possible the location of units in the parts of the boiler where blower elements made of other materials cannot be placed.

At the present time an investigation is being undertaken by the General Electric Company and the Diamond Power Specialty Company on the subject of the life of condensor tubes. The investigation is being undertaken with the idea of determining the possibilities of utilizing calorized copper tubes for this purpose. Calorizing has proved of value in preventing oxidation of soot blower units, pyrometer protection tubes and other equipment at points of high temperature. It is not so generally known that calorizing has been used successfully for some time under certain conditions as a means of preventing corrosion.

There are many possible applications of calorized metal which have not been considered owing to the fact that this process has been available to the commercial world but a short time. It is impossible to enumerate or describe in detail a great number of applications. Every plant presents its individual problems, and every engineer, metallurgist and plant manager can readily see possible applications to special equipment used in his own process of manufacture.

SHORT-TURN OVERHEAD TROLLEY SYSTEM

Although the Short-Turn Overhead Trolley System is comparatively a new departure, several installations are now in use. The track consists of two parallel standard rolled channels, spaced 2⅛ inches between flanges and held in place by clamps. The track is designed to carry loads with no intermediate supports, except at the splices, corners and switch points, and is fabricated to meet the requirements of each condition.

One feature of this system is that in spanning a long span over

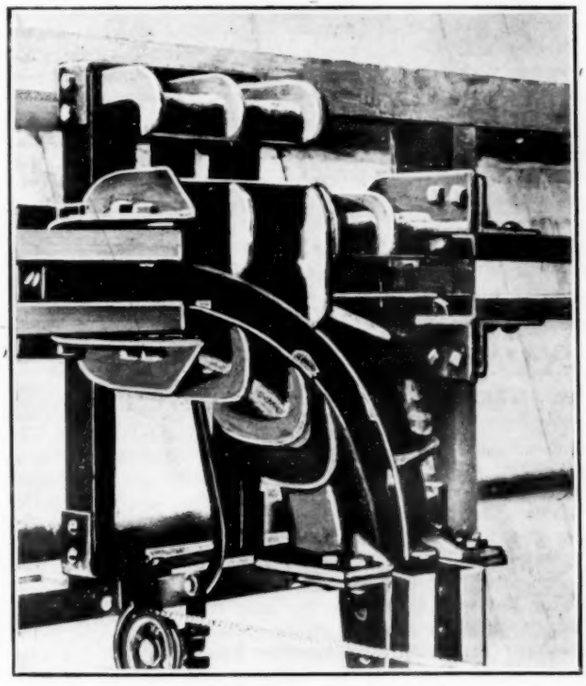


FIG. 1. STANDARD SHORT-TURN SWITCH AND CORNER (SEEN FROM BELOW) SET FOR 90° LEFT TURN

a driveway from one building to another, this can be done without intermediate supports by using a heavier section of channel, keeping the channels 2⅛ inches between flanges, but extending down to the depth of the channel.

The Short-Turn Trolley System consists of the standard channels, 90-degree right switches, 90-degree left switches, 45-degree right switches, 45-degree left switches, and the universal switches. Each corner and switch connection is interchangeable, so that any time in the future a right corner can be removed and a double switch or universal switch be bolted in the same place. The design and compactness of the Short-Turn Universal Switch are said to give much greater switching facilities and covers much greater space than any other switch.

All of the Short-Turn corners and switches have a track curvature of 18 inches, so it practically turns the load at a right angle. This is especially adaptable in foundries in getting up and serving a row of brass furnaces or machines close to the wall without losing valuable space by long, sweeping curves. It is also especially adaptable to freight houses and terminal houses. This Short-Turn System can be brought out of the warehouse and run along the receiving platform, then a structure can be thrown out so as to load an automobile truck. This system can also be

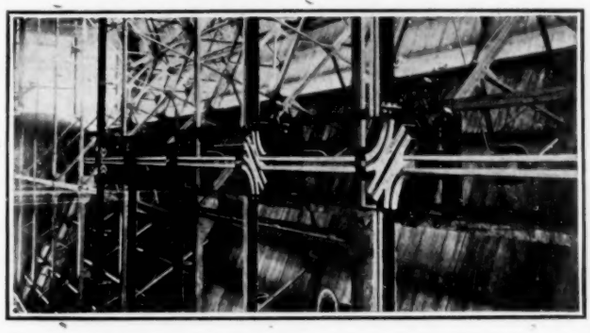


FIG. 2. UNIVERSAL SWITCHES IN SHORT-TURN TROLLEY SYSTEM

readily wired should an electric hoist be desired to be used in the place of a chain block.

The track is built and shipped and can be erected as single units and, it is claimed, greatly reduces the cost of erection. This track equipment is equipped with special 2-wheel, 4-wheel, or 8-wheel trolleys. These trolleys have all ball-bearing wheels and guide rollers, which run between the toes of the channels, eliminating friction, making it impossible for the wheels to bind against the track when rounding the curves.

The design of this trolley permits it to swing in the same 18-inch radius curves. The fact that this track is built from standard rolled channels, or can be built from I-beam sections, where long spans and greater strength is required, makes it very easy to obtain from local stocks and easier to erect.

This system is being manufactured and sold by the Whiting Corporation, Harvey, Ill.

ALUMINO-PLATING

It was during the course of a lecture, held at Cooper Union in New York upon request of parties interested (March 19, 1921), that Dr. Reinhold performed some experiments. The subject was aluminum and actions of aluminum salts.

A request for further details has been made, which is responsible for the following lines on an "alumino-plating" process. The prefix "alumino" does not mean a depositing of aluminum onto other metals, nor does it mean that other metals are deposited on aluminum. Analogous to the expression "electroplating," it stands for a source of reactive power, which is responsible for the deposits obtained.

Experiments with aluminum showed peculiar reactions as soon as certain conditions were abided by. A process was developed which allows plating without the use of direct current.

Zinc, lead, tin, copper, silver, gold can, it is claimed, be plated onto zinc, lead, tin, iron (wrought or cast without previous copperstrike) copper, silver and gold. Potassium and sodium can also be gotten in a metallic state. The solutions are non-poisonous, their preparation is not complicated at all, the price being quite reasonable. Commercial flash coatings, lacquered subsequently, can, it is stated, be produced in fractions of one minute.

The thickness of plate or amount of metal to be deposited depends upon time of immersion. The solutions of an aqueous nature work at a temperature range of between 70 to 185 degrees Fahrenheit.

A number of articles plated with this process can be examined at the office of the Senter-Robbins Metals Company, Inc., 217 Broadway, New York City.

KWID CLEANER

In our July issue, page 299, it was stated that Kwid was a mild alkaline cleaner. This was an error, as Kwid is stated to be absolutely free from alkaline, according to the distributors, the Claxton Sales Corporation, 54 Market street, Paterson, N. J.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

In co-operation with the National Research Council, the American Foundrymen's Association is undertaking an investigation of Natural and Synthetic Molding Sands and of the Employment of Greater Proportions of Used Sands in Molding Operations; also a study of Refractory Sands and Refractory and Plastic Clays. The program as laid out at present is:

1. To collect all published information available on these subjects in this and foreign countries. (This work is now well under way.)

2. To study and formulate by field operations of a practical technical investigator the practices in the best foundries of the country.

3. To submit all information so obtained to a committee composed of practical foundrymen and technical experts, with a request that this committee formulate suggestions for promising lines of research that might be followed to attain the desired end.

The bibliographies were prepared by the National Research Council. The work of the technical investigator is made possible by funds generously placed at our disposal for research work.

Members of the association are interested in the development of the foundry industry and can do their part by giving any information they may have acquired on this subject. A questionnaire, which can be obtained from the secretary, will aid in supplying information helpful to the committee.

If the members will co-operate in this work a preliminary report can be submitted at our next convention in the spring of 1922. Help the investigation to be of value to the foundryman.

NATIONAL CHEMICAL EXPOSITION

That the coming National Chemical Exposition—the seventh—will be the greatest in the history of the chemical industry of the United States is no longer doubted. The show will be held in the Eighth Coast Artillery Armory, New York City, during the week of September 12, and every inch of space will be devoted to showing the progress of chemical research in America. This, as is well known, has astonished the scientific world in the past five years, for before the World War America held only a minor place in the Chemical Hall of Fame.

Thus far more than 400 exhibitors will have places in the exposition. Last year the total was 457, and before the books are closed for the 1921 show, Fred W. Payne, who with Chas. F. Roth is managing the exposition, expects that last year's figures will be exceeded. It is certain that every branch of chemistry will be represented and that the public will be introduced to many new and important phases of chemical development.

The 1921 display will present to the visitor a somewhat different aspect from its six predecessors. The Armory building, which is the biggest structure of its kind in the world, can take care of the display on its one vast floor, comprising 180,000 square feet. Thus the appearance of the show will be much more impressive than it was when staged on four floors of Grand Central Palace.

Plans to make the seventh exposition the greatest in the history of the industry are progressing favorably. It will follow immediately the meeting of the American Chemical Society and the Society of Chemical Industry, and the sponsors of the display report more interest than ever, not only in the chemical industry itself but in numerous other industries, which necessarily are interested in chemicals and chemical machinery advancement.

In the auditorium, which is a solid brick and fireproof structure at one end of the building, the program of speakers during the week is being perfected and motion pictures will be shown. The plans include symposia of Chemical Engineering subjects; one on Evaporating and Drying, another on Crushing, Grinding and Pulverizing, and a third on Material Handling Equipment.

NEW YORK BRANCH, A. E. S.

President J. A. Stremel presided at the July meeting. Two applications for active membership were received and referred to the board of trustees. The following plating problems were discussed:

Barrel plating, black nickel.

Spotting out on gold plated antimonial lead.

Oxidizing with liquid sulphur and other chemicals.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

Charles H. Fleischer, production superintendent of the Stanley Works, New Britain, Conn, was presented with a gold watch by the company in honor of his completing 25 years' continuous service. The presentation was made Wednesday, June 1, by E. A. Moore, president, in the presence of the officers of the company, factory superintendents and department heads.

CHARLES H. FLEISCHER.

Mr. Fleischer's period of service at the Stanley Works extends over 37 years. He started to work there during the vacations in 1884; and in 1891 he came to work as a regular employee, coming to work for his father in the plating room. Mr. Fleischer spent four years in that department and resigned in 1895 to take up a position with the D. J. Dixon Manufacturing Company of Albany, N. Y. This company manufactured transom hardware. A year later it was burnt down and Mr. Fleischer returned to the Stanley Works June 1, 1896, just 25 years ago. At that time he returned to the plating department, of which his father was foreman.

Most of Mr. Fleischer's time has been devoted to the plating and finishing end. For about ten years he was in charge of the plating room and for about five years was in charge of all the finishing departments.

During the war Mr. Fleischer was transferred from the plating department to take charge of the magazine work on the light Browning auto-machine gun, and after the war he spent about a year with shipping and packing departments. Last year he was made production superintendent.

Mr. Fleischer is the son of Mr. Herman Fleischer, who will complete 52 years of continuous service with the Stanley Works in October of this year, having been the first electroplater in the hardware line in Connecticut.

W. H. Bassett, technical superintendent of the American Brass Company, has been elected chairman, and G. C. Stone, metallurgist of the New Jersey Zinc Company, secretary, of a committee on zinc and zinc ores, recently organized by the American Society for Testing Materials, to work in co-operation with the American Zinc Institute.

George J. Karl, who has long been connected with Maas & Waldstein Company, intends to make his home in Bridgeport about September 1. He will look after Connecticut for this firm, and in living there will be able to keep in close touch with all of his many friends.

Frederick Fraley Sharpless, has been selected as secretary of the American Institute of Mining and Metallurgical Engi-

neers, by the directors of the Institute. He was born in West Chester, Pa., his early days were spent on the farm in the center of Revolutionary battlefields. Through the companionship of his father, an able mineralogist, the gathering of a collection of his own from the riches of Chester County and the enthusiasm of an Ann Arbor graduate, an instructor in the normal school of his native town, young Sharpless formed a desire to study chemistry. Columbia and Massachusetts Tech. were beyond his means, but Michigan was possible, so he studied chemistry at Ann Arbor, under such men as Prescott, Cheever, Pettee and Alexander Winchell.

Mr. Sharpless became a member of the Institute in 1889. He was one of the members visiting Europe that year as the guests of European mining engineers.

From 1900 to 1912, Sharpless traveled about, reporting, exploring and operating for English principals, chiefly as American representative of the Consolidated Mines Selection Company of London. This work took him to British Columbia, the Yukon, Alaska, to many parts of Mexico, into Salvador, Honduras, and South America. Two years were spent in Colombia, a season in Asia Minor, and another season in the bush on the West Coast of Africa, in mining examinations. During this time he also made a trip to Dawson.

During the past eight years Mr. Sharpless has had an office in New York, where he has been carrying on consulting work, visiting many of the mining districts through the United States, Mexico and Canada. Mr. Sharpless also was secretary of the Mining and Metallurgical Society of America for three years.

Ferdinand Deming, the dean of the brass rolling mill men of the United States, spent a few days in New York while en route to Birmingham, England, on a business trip.

Edward H. Mangan, for several years plant engineer for the Norton Company at Niagara Falls, has entered the employ of the General Abrasive Company, Niagara Falls, N. Y., as sales manager.

W. R. Hyde, for several years special western representative of the Hilo Varnish Corporation, with headquarters in Chicago, will take over the New York and Pennsylvania territory formerly covered by J. Frank Brown. Mr. Hyde will make his headquarters at Buffalo for the present.

DEATHS

THOMAS F. FALLON

Funeral services for Thomas F. Fallon, for many years proprietor of Fallon's brass foundry on South Broadway, who died July 9, 1921, at his home, 3 Kingston street, Lawrence, Mass., were held at the family home.

Members of Lawrence Lodge, B. P. O. E., 65, which he had served so faithfully and long, were in charge of the services. The ritual was read by Michael A. Flanagan, exalted ruler of the organization, assisted by Donald C. Bennink, Arthur B. Keefe and John J. Burns. The Orpheus Quartet sang several selections. At the graveside at Bellevue cemetery, final services were read by Joseph Hargedon, chaplain of the Elks.

WALLACE R. DUDLEY

Wallace R. Dudley, superintendent of the Jonathan Bartley Crucible Company, died recently at St. Luke's Hospital, Philadelphia, after a short illness. He had been affiliated with the Bartley company for some time. He was a member of the various branches of the Masonic fraternity and the Lions Club. He was 49 years old and leaves a wife and one daughter. His father is William W. Dudley, of the Dudley Watch Company, Lancaster, Pa. The deceased lived at 710 Parkside avenue, Trenton, N. J. The interment was in the family plot in the Ewing, N. J., cemetery.

WILLIAM BROWNE COGSWELL

William Browne Cogswell, founder of the Solvay Process Company, manufacturer of soda products and one of the great industrial concerns of the country, died at his home, 320 Park avenue, New York City, of blood poisoning resulting from an infected ear. Mr. Cogswell was in his eighty-seventh year. At his bedside were his wife and two physicians, Dr. H. G. Locke of Syracuse, N. Y., where he made his residence for many years, and Dr. H. V. Guile.

The founding of the Solvay Process Company followed a visit of Mr. Cogswell, who was a civil engineer, to Europe, where he made a study of the soda industry. He was commissioned by Solvay & Company of Belgium to locate a plant in this country, and upon his return in 1881, formed the company at Syracuse, N. Y. Mr. Cogswell was born at Oswego and had been brought up in and near Syracuse.

The company was capitalized at $300,000. Today the company is capitalized at $36,000,000, and through its allied companies, the Semet-Solvay Company and the Solvay Collieries Company, owns a chain of coke by-product plants throughout the country.

Mr. Cogswell was educated at Hamilton Academy in Oneida county, N. Y., and the Rensselaer Polytechnic Institute. During the civil war he was appointed mechanical engineer in the United States Navy at Port Royal, S. C., and in 1862 took charge of the steam repair and construction work at the New York Navy Yard. Following the civil war he was superintendent of the Franklin Iron Works Company at Syracuse.

He was a member of more than 100 engineering, scientific and social organizations, and in this city was a member of the Union League, Republican, Engineers and University clubs.

EGBERT SPENCER BRONSON

Egbert Spencer Bronson, for many years a highly esteemed citizen of Ansonia, Conn., passed away at Woodmont, Conn. July 14, 1921, following an illness which extended over several years. Some fourteen years ago he suffered a stroke of paralysis from which he never fully recovered.

Mr. Bronson was 72 years of age. He was the son of Spencer and Polly Hemingway Bronson and was a native of Plymouth. During his early years his family moved to Ansonia, where he made his home until thirteen years ago last January. He was a resident in Ansonia when the Civil war broke out, and during the latter years of it he served with the Union army. He participated in a number of engagements, during one of which he was quite severely wounded.

For a number of years following the war Mr. Bronson worked at the clock making business, later going with the Ansonia Brass & Copper Company (now part of the American Brass Company), in its rolling mill department. By his industry and faithfulness he rose to the position of superintendent, which position he held until sickness overcame him. He was with this concern for twenty-seven years.

Mr. Bronson on several occasions was honored with public office by his fellow townsmen, serving on the borough burgess board at one time and for quite a number of years was a member of the library board. He was of a quiet, retiring nature, with an unusually pleasing personality. He was well known to many of the older residents of Ansonia, all of whom will regret to learn of his demise.

Mr. Bronson was a veteran of the Civil war, a member of the Masonic order, and a member of the First Congregational church of Ansonia. His wife, Margaret Mathis, a native of Clinton, N. C., died about twenty years ago.

Mr. Bronson is survived by a son, Roscoe E. Bronson of New York City, a daughter, Mrs. J. L. Barham of Goldsboro, N. C., and one grandchild, Katherine Barham.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

AUGUST 1, 1921.

A recent survey of industrial conditions in Waterbury has resulted in several encouraging revelations. To begin with, the majority of the factory heads are looking for more and better business immediately following the traditionally dull period during July and August. The immediate future is clothed with optimism, which is a big step away from the depressing atmosphere by which the city, industrially, has been enveloped since the beginning of the year.

Interviews with a number of local business men indicate that more people are at work at present than is commonly supposed to be the case. They are not as yet working on the pre-war full time basis, but employment figures show that the manufacturers are striving to equalize the amount of work to be had as much as possible.

The turning point has apparently been reached. June was the last month to record a decrease in industrial operations. Although the pick-up since then has hardly been noticeable, there is considerable optimism manifested over the fact that the period of depression has struck bottom. Various manufacturers have given out the following summaries of general conditions and employment data compared with normal times, and some views on the immediate future:

American Brass Company.—The company is now employing practically the same number of men as in 1914-1915, the years which preceded the local war boom. They are working 40 hours a week against the 55-hour week at that time. John A. Coe, president of the concern, looks to a decided improvement in industry within a comparatively short time. He points out that there are a number of important European questions to be decided, stating that it is a matter of opinion as to whether this country can continue successfully while conditions are unsettled abroad.

Scovill Manufacturing Company.—The number of men employed at this company is almost exactly the same as the number employed in July, 1914. The average number of hours per week, however, is but 60 per cent. of the average number in July, 1914. The Scovill situation, therefore, is 60 per cent. of the normal, pre-war basis. The employees are working on an average of 30 hours a week, compared to a 55-hour week in vogue during the summer of 1914. E. O. Goss, president of the Scovill Manufacturing Company, when interviewed, said that he could see no chance for improvement for a month or two but was very hopeful of a change for the better at the end of that time.

Waterbury Manufacturing Company.—C. W. Henger, manager of this plant, reports a business of about 50 per cent. of normal, as compared with last year. This company has arranged matters so that more than one-half of their employees are working on 32 to 40 hour-a-week schedules.

Chase Rolling Mills and Chase Metal Works.—R. D. Ely, general manager, reports about one-third of the number of employees in the mills as compared to a year ago. The men are working a shorter number of hours. Mr. Ely feels that the situation is gradually becoming more settled. He said that people are running out of supplies and that the public is becoming convinced that it can buy today on values more nearly normal. He also believes that the jobbers and other customers are beginning to clean up their stocks, citing as evidence numerous hurried orders that are being received by his concern. He expects that conditions will be much better by early fall.

Waterbury Clock Company.—This company is running along on a 50 per cent. of its normal help and time basis. William J. Larkin, head of the plant, states there is little in sight in the clock business at present. He attributes much of the present slack business to the fact that the buyers' strike overreached itself.

Randolph-Clowes Company.—This plant is employing at present two-thirds of its normal number of employees and these are working on an average of 32 hours a week, against the regular 55-hour schedule. Officials of the company look to better times after August.

American Ring Company.—Seventy-five per cent. of the normal number of employees of this plant are now working on a 32-hour week basis. Officials expect better business by September.

American Pin Company.—A total of 730 out of the 950 employees of this company are working three days a week. Some departments are working five days. Pin business exceedingly dull. Brass departments better. Prospects much brighter than last month.

American Mills Company.—This concern is operating full time, with more than the average number of employees at work.

Novelty Manufacturing Company.—Two-thirds of its normal force is working on a 45-hour week basis. Officials state that better business is in sight, but present conditions being hampered by refusal of retailers to reduce the price of articles in proportion with reductions made by the manufacturers.

Plume & Atwood Company.—This concern is working on a 40 per cent. basis compared with normal times. Officials look for better business in the fall.

Mattatuck Manufacturing Company.—Eighty per cent. of this concern's employees are working on an average of 65 per cent. of the normal number of hours per week.

Waterbury Buckle Company.—Has been operating full time for the past month.

Bristol Company.—Sixty per cent. of its normal force is working on an average of 4 days a week.

Oakville Company.—No estimate available from officials of company, but employees are working short time.

Blake & Johnson Company.—Seventy-five per cent. of its employees are working 4 days a week. Officials say present outlook is blank and are unwilling to give opinion as to the future.

Rogers and Brothers.—Five days a week. Of a normal force of 400 employees, 275 are now at work.

Manville Machine Company.—Reginald Brennan, manager, states present business exceedingly dull. Basing his deductions on the reports of salesmen throughout the country, Mr. Brennan believes that the pickup will begin in September and will have reached normal by November.

On July 7 a bronze tablet was unveiled in the home office of The Chase Companies in honor of Henry Sabin Chase, for many years president of the company and brother to Fred S. Chase, the present incumbent. The tablet, which was formally presented by Charles W. Henger, chairman of the memorial committee of the Chase Foremen's Association, was placed in a niche at the head of the main stairway of the beautiful granite building which contains the main offices of the big company. The tablet, which shows a likeness of the former president in relief, was accepted on behalf of the company by Fred S. Chase. In speaking of his brother's successes in life and business Mr. Chase remarked that, coupled with his manly energy and honest striving was the true spirit of the philosopher. "He had the heart of a man and fought bravely." Some of the older employees of the company were also called upon for a few words. Adolph Recker, with 34 years of active service to his credit, spoke of the early struggles of the Chase factory. Others of many years standing who spoke were George E. Comstock, H. M. Upson, W. G. Green and Richard D. Ely.

Following is the inscription which appears below the relief of H. S. Chase:

"In Grateful Memory of HENRY SABIN CHASE, born October 1, 1855. Died March 4, 1918. For many years the Honored President and Guiding Spirit of These Companies and a Man of Rare Vision in the World of Business Adventure and One Whose Understanding Heart Lent Cheer and Courage to His Fellow Men. A Man He Seems of Cheerful

Yesterdays and Confident Tomorrows. This Tablet Is Erected by the Foremen of the Chase Companies."

The tablet was designed and made by Ulysses A. Ricci of New York, under the direction of Cass Gilbert, architect of the magnificent Chase office building.

NEW BRITAIN, CONN.

AUGUST 1, 1921.

Although summer is half gone and fall a matter of but a few weeks, the hopes that were expressed in the spring for a general improvement in the manufacturing industries seem as far from realization as ever. In fact, instead of conditions improving among the local metal manufacturing concerns, they have been growing steadily worse. Unemployment is more general than it has been, wage cuts have followed wage cuts, there has been no satisfactory increase in the working hours and, all in all, it is a dark future that faces manufacturers. This is not a pessimistic view, but a statement of facts as they exist at present.

Coming down to more concrete instances, it might be stated that the entire plant of the **Corbin Screw Corporation** has been put back on a 55-hour week basis. On the face of it, this looks very encouraging, but investigation belies this. In the first place, the working force has been materially reduced. In the second place the wages have been cut about 20 per cent. And, finally, the increased working schedule is not to supply new orders coming in, but is simply to replenish the depleted stock rooms. Thus, it is believed by those in a position to know, it is hardly likely that the existing working schedule will continue more than a month, or two months at the most, unless in the interim there is a general pick-up in business.

At the **Russell & Erwin** division of the **American Hardware Corporation** a large number of hands have been laid off. The plant is working on short time and a new wage cut has become effective.

Landers, Frary & Clark are also feeling the depression with the rest. There has been a general cleaning out of all excess help, including the office force, together with substantial wage cuts. Orders are very slack and there is but little business at present. Recently this firm put a new urn of elegant design on the market and is also about to put an improved electric vacuum sweeper on the market.

The **Corbin Cabinet Lock Company** and the **P. & F. Corbin Company** are plugging along with a curtailed force on a working schedule of 32 hours per week.

The **Stanley Works** and the **Stanley Rule & Level Company** are experiencing difficulty in finding a ready or expansive market for their products and the **New Britain Machine Company** is operating on just a skeleton force. About all that is being done at this plant is finishing up small single orders. The tractor business seems to have fallen rather flat and although the company is constantly making improvements on its machine, there has not yet developed a market of sufficient strength to warrant the manufacture of this machine in any quantity.—H. R. J.

TORRINGTON, CONN.

AUGUST 1, 1921.

Conditions in the metal industries in Torrington remain practically unchanged. If anything they are a shade worse than they were a month ago, in spite of the fact that most of the shops were closed during a large part of July for inventory and repairs. Operations have been resumed on a four-day schedule, eight hours per day, with considerably curtailed forces. There are 200 additional men idle now as compared with a month ago.

Special town and borough meetings were held during the past month to provide appropriations for street improvement work in order to aid men with families who are destitute. About $75,000 will be spent. Ordinarily this expense would all be paid by the borough but in this emergency, the town, which has the care of paupers, will pay the labor bills, thereby providing aid for the destitute without putting them to the humiliation of being classed as paupers. It is hoped that this temporary relief measure will tide over many families until a resumption of industrial activities.

Even the most optimistic persons have pessimistically declined to make predictions as to when conditions will improve. Early in the summer it was felt generally that late summer or early fall would see a marked resumption of activities but up to the present time there has been nothing to justify the belief that this hope is to come true. In the building trades the outlook is a little better, there having been a noticeable increase in building work in Torrington within the past few weeks. The business men appear to have great faith in the future and are preparing to be ready for the boom when it comes. This is evidenced by the fact that much of the building is for the mercantile branches.—J. H. T.

ROCHESTER, N. Y.

AUGUST 1, 1921.

There is very little to report concerning Rochester's metal-using industries at the close of this month. While business conditions have suffered no further setback, there has been no material alteration in the usual mid-summer condition. The outlook for the coming fall season is not over-bright, although some manufacturers profess to feel that business is going to pick up in very short order.

The prolonged strike of the building trades, which has continued since April 1, is believed to be near the end. Much building is now proceeding, and the conclusion of the strike will witness a rush on the part of the contractors to begin and complete hundreds of jobs about the city. In almost every contract the metal industry figures prominently, and the local demand for finished products of copper, brass, aluminum, lead, bronze, antimony, and silver-plate will be tremendous for a considerable period.

Rochester members of the Electro-Plater's Society, who have recently returned from the annual International Convention at Indianapolis, report that the convention was the most successful ever held by the society. The woman's auxiliary of the Rochester branch will meet at Ontario Beach on August 10th and 24th.

The Rochester Auto and Tool Company, which is a $75,000 concern financed by persons of Polish descent in Rochester and Detroit, will remove the plant to Poland in September. Arthur Sierka, one of the heads of the firm, says there is a great future for the auto-tool business in Poland once affairs become normal in that unsettled country.—G. B. E.

ROME, N. Y.

AUGUST 1, 1921.

There was no apparent improvement in business conditions in the metal industry plants of this city during the last month over those prevailing during several months past, but when business comes into its own again brass and copper interests will be able to turn to the Rome plants with assurance that nothing will be found wanting in the way of handling the largest possible volume of business, for everything has been put in readiness to that end. All necessary repairs and changes and additions have been made, and the trade will find the brass and copper center of the Empire State 100 per cent. efficient in taking care of all the demands that will be made on the well-known industries of this city.

A three-day-working week has been the rule here during much of the first half of this year, and no one seems competent to predict with any degree of certainity when a marked improvement will take place. Everybody, however, is optimistic and it is hoped that the tide will change for the better with the turning of the leaves during the Autumn months.

The period of business depression has had no effect upon the interest in industrial baseball games, which are played by teams representing the Rome Brass & Copper Company, Rome Manufacturing Company, Rome Wire Company and the Rome-Turney Radiator Company, and great crowds are regularly in attendance at these exhibitions.—M. J. D.

PROVIDENCE, R. I.

AUGUST 1, 1921.

It is a long time since the metal industy in all its various branches has been so dull as at the present time. While the general business and building depression throughout the

country are principally responsible for this condition, there are numerous specific conditions peculiar to each separate branch that also contributes materially to the existing dull times. Many concerns throughout the State that have practically never been shut down before are now feeling the depressing influences to such an extent that they are either entirely closed or are operating on a very limited schedule, both of help and hours. It is estimated that several thousand employees in the metal working plants of the State are out of work, or working about one-third to one-half normal schedule.

The extensive plant of the **Gorham Manufacturing Company,** silveware and bronze workers, on July 18 began a five-days-a-week schedule for the first time since last November, when the plant went on a 27-hour-a-week schedule. This does not refer to the bronze department, which has been operating on a full time schedule with a full complement of operatives. The reason for the activity of this department is due largely to the great number of bronze memorial tablets of every description that are being made by the Gorham Company for delivery to all parts of the country. There is not a village, town or city in the country that has not ordered or planning to order a tablet or bronze memorial of some type, while clubs, churches, societies, manufacturing concerns and organizations from one end of the land to the other are ordering these tokens to perpetuate the memory of those of their number who served with the colors.

The **Brown & Sharpe Manufacturing Company,** of Providence, has recently received from Joseph Jannell & Company, of Woonsocket, a novel motor vehicle, to be used in its paymaster's department for the purpose of conveying its payroll money from the bank to the plant, and also to convey deposits from the plant to the bank. It is a bullet-proof truck. The enclosed truck body, a spacious affair with several seats inside, is mounted on a chassis. The walls of the body are made of two steel plates with an inch and a half of felt between them. The roof is sheet steel, as is also the floor. There are no windows in the body, but there are two loopholes about four by six inches in size, on either side, through which guns may be aimed,

The most interesting part of this bullet-proof conveyance is the recently invented glass used in the windows of the driver's cab and in the wind shield. This glass is one inch thick and is absolutely bullet-proof, as tested by the firing at close range of a 45-calibre bullet directly into the glass. The glass merely crystallizes about the bullet. The steel plates are all riveted and the vehicle cost about $1400.

Hugh J. Finnegan has established a foundry for the making of all sorts of brass, bronze and aluminum castings in a building in the rear of the junction of Main street and Highland avenue, Lippitt. The business has already become established and some castings have been made. George L. James is the manager.

H. J. Astle & Company, manufacturers of polishing and electroplating systems, report that they are busy and that mail orders keep a large force of mechanics at work. The company has been experimenting for a few years on a Boland system for drying in the textile mills which it has now perfected and patents have been granted on this machine in the United States and many foreign countries. The Astle Company has enough orders on this machine alone to keep them busy for several months and is arranging to manufacture these dryers in many parts of the world.—W. H. M.

TRENTON, N. J.

AUGUST 1, 1921.

The **Clark Blade and Razor Company,** of 119 Sussex street, Newark, N. J., has obtained from Vice-Chancellor Backes an order compelling **Verstraete & Sons,** metal manufacturers, of 10 Railroad Place, Newark, to show cause why they should not be enjoined from having patented machines for the making of safety razor blades. The Clark Company let a contract to the Verstraete concern for the manufacture of the machines. The complainants contend that they have expended $30,000 in the development and production of razor blade machinery.

The **Jonathan Bartley Crucible Company** has announced its intention of being one of the Trenton concerns to take space at the trade exposition to be held at Caracas, Venezuela, this fall. Free space will be offered to manufacturers who want to place goods in the exhibition. The material will be translated into Spanish and forwarded to the big trade exposition.

The **Essex Metal Ceiling Company,** of Newark, N. J., has been incorporated at Trenton with $50,000 capital by George and Aaron Herr, of 584 Bergen street, Newark, to manufacture metal ceilings, etc.

The **Five-in-One Auto Signal Company,** of 298 South Sixth street, Newark, N. J., has been organized to manufacture auto signal devices by Louis M. Lombregilo.

Safety Gas Appliance Company, of Hoboken, N. J., has been incorporated with $100,000 capital to manufacture safety gas appliances. Paul Devarco, W. H. Wart and William J. Connelly are the incorporators.

The **Decker Manufacturing Company,** of 251 Elm street, Newark, N. J., has been incorporated to manufacture blow torches. Edward L. Decker, of 540 Muriel street, Elizabeth, N. J., is at the head of the company.

The **C. S. Manufacturing Company,** of Nutley, N. J., has been incorporated by Carl Schneider, of 28 Woodland avenue, Nutley, N. J., to manufacture automatic valves.

Aaron Friedman, of the New Process Metals Company, 7 Mulberry street, Newark, N. J., will erect a factory building for the manufacture of metal products.

The **Trenton Chilled Die & Castings Company,** of Trenton, N. J., has been incorporated with $100,000 capital by Richard B. Newton, John H. Conover and B. N. Rich.

Judge Bodine, of the United States District Court, has appointed William E. Green, of Trenton, N. J., as receiver for **Katzenbach & Bullock Company, Inc.,** Trenton, N. J. The firm has been in business in Trenton since 1910, when it was organized to deal in pigments and other chemicals. The receiver was voluntarily applied for by Mr. Bullock, president of the company, after the board of directors had passed a resolution approving his action. The petitioner, in his complaint, states that the company has outstanding liabilities of approximately $400,000 and assets of approximately $600,000. Included in the assets is $362,500 of bills receivable from debtors who have been hard hit by depression in business and many of whom have been forced into receivership. Practically all of this sum, however, is regarded by the firm as collectible, the difficulty being that in some cases it will require two years before the entire sum is realized.

The metal industry shows little activity in Trenton and some of the big plants are operating less than five days a week, with the exception of the **Skillman Hardware Manufacturing Company.** The big plant of the **John A. Roebling's Sons Company** is only running on part time and there are no prospects in sight when the mills will be put on full time. The Roebling plant at Roebling, N. J., is running three days a week, while the **Mercer Motors Company** plant is closed down. As one manufacturer puts it, "If everybody waits for the price of everything to drop further we will have to close down our factories." It seems as though the buying public expects a drop in prices before it buys.

The resumption of building activities will, it is believed, cause business to pick up shortly. Mechanics quit work some time ago when the master builders announced that they would put a new and reduced wage into effect as a means of increasing building operations. The mechanics refused to work and finally the trouble was adjusted by a mediator and operations were resumed.

The **Essential Oil Specialties Company,** a subsidiary of the American Linseed Company, has purchased the plant of the **American Lamp and Brass Company** at Trenton, N. J. The plant will be greatly improved and additions added. Gustave Mahlek, of 1324 South Fifty-seventh street, Philadelphia, is vice-president and general manager of the oil company. The concern was formerly the Clark Brass and Lamp works and was later sold to the American Lamp and Brass Company.

Metal Materials Company, of Asbury Park, N. J., has been incorporated at Trenton with $125,000 capital stock, to deal in building materials. The incorporators are Roscoe C. Tagle,

Frank V. B. Young and Isaian Matlack, of Asbury Park.

Goldman, Kolber & Wittgren, Inc., of Newark, N. J., has been incorporated with $50,000 capital as jewelers. The incorporators are Joseph Goldman, Abraham E. Kolber and Arthur D. Wittgren, of Newark.

Jewelers' Smelting Company, Inc., of Newark, N. J., has been incorporated at Trenton, N. J., with $100,000 capital to deal in jewelry. The incorporators are Marcel Godfrey, Milton A. Helmlinger and Harry C. Helvilimer, of Newark.

Automatic Coin-Change & Record Company, of Bound Brook, N. J., has been incorporated at Trenton with $1,000,000 capital to manufacture automatic coin change devices. The incorporators are Irwin J. Palmer, Fred A. Frobose and Jeremiah J. Reegan, Bound Brook, N. J.

BALTIMORE, MD.

AUGUST 1, 1921.

When the **Coale Muffler and Safety Valve Company,** 325 East Oliver street, took over the **Linthicum Bronze Foundry** recently, equipment was added to practically double the output of the plant. The two companies had been operating under the same roof.

The National Utensils Manufacturing Company, recently incorporated under the laws of Maryland at $125,000, has fitted out manufacturing space at 207 Guilford avenue, and will begin the production of a new combination heating device designed to effect a saving in the amount of gas required for household cooking purposes. Henry L. Mendal, president of the company, is the designer of the device, which is now being manufactured at the local plant, and is himself a Baltimorean. W. J. DeMar is vice-president, and W. Edward Bockmiller, secretary and treasurer.

More than 1,500 employees of the **Tin Decorating Company** and their friends are now willing to vote that the outing recently given them by the company was a huge success. The steamer Dreamland was chartered for the occasion. At Chesapeake Beach there was bathing and water sports of all kinds. W. R. Janney, superintendent of the company, was in charge of the affair.

The **T. H. Symington Company** has declared a dividend of fifty cents on the common and regular quarterly dividend of two per cent. on the preferred stocks. The common dividend was paid on July 15 and the preferred on July 1 to stock of record June 15.

Explaining the action of the board of directors of the **Baltimore Tube Company** in postponing the payment of the quarterly dividend on the company's preferred stock, which in the ordinary course would have been paid on July 1, President C. S. Morse has issued the following statement: "At a recent meeting of the board of directors of this company it was decided that action on the payment of the dividend on the preferred stock of the company be indefinitely postponed. This action on the part of the directors does not reflect any material change in the situation since the first of the year, but as no immediate improvement is in sight, it was deemed best for the interests of the company that its cash resources be conserved in order to maintain the strong position in which the company still finds itself in spite of the falling off of business."

The **Simmons Company** is building a new distributing warehouse and factory at 1220 East Fort avenue. This company has factories for the manufacture of all metal beds, located throughout the country, besides 60 distributing stations.

W. J. L.

INDIANAPOLIS, IND.

AUGUST 1, 1921.

The **Mid-West Metal Products Company** has been organized at Muncie, Ind., with a capital stock of $100,000. The company will manufacture metal products from non-ferrous metals. The organizers of the company are Alvah J. Rucker, of Indianapolis; C. R. Cameron and E. B. Simmonds, both of Muncie.

Steady employment through the winter is in prospect for 800 workmen at the **Kokomo Brass Works,** Kokomo, Ind., according to a statement by J. W. Johnson, manager. The plant now is running at full capacity and the men are working overtime two or more nights a week. Retail sales of carburetors, one of the products, amounted to a total of 40,000, the largest in the history of the company, during the past month, while other articles are being pushed to the limit with excellent signs of increased sales each week.

Articles of incorporation were filed recently in the office of the Secretary of State for the **LaBelle Manufacturing Company.** The capitalization is for $250,000. Officers of the new corporation are: J. F. Scott, president: C. S. Walker, secretary-treasurer, and H. R. Victor, vice-president. The company will begin the manufacture of an electrically driven washing machine within the next three or four months, according to officers. At present the company is negotiating for the purchase of a suitable plant. It is estimated the company will require a plant with about 75,000 feet of floor space and capable of turning out 20,000 machines a year.

The **Wabash Cutlery Company** has begun operations at Terre Haute, Ind. The company does a large amount of plating in both gold and silver and promises to be one of the largest companies of its kind in Indiana. The plant now is turning out about 22,000 knives a week and has sufficient orders to work at capacity for several months, officials of the company state.

Several of the metal manufacturers of Indianapolis have signed a petition filed by the **Indiana Public Service Commission** asking for a reduction of power rates asked by the two Indianapolis power companies. The manufacturing establishments ask that the surcharge rates be reduced approximately 50 per cent. The petitioners declare that when the last increase was awarded the companies, coal selling for $4.22 was one of the reasons used in obtaining the grant. It was set forth that coal has dropped about a dollar a ton.

The **Concord Foundry Company** at Elkhart, Ind., has filed notice with the Secretary of State that its corporation will be dissolved.—E. B.

DETROIT, MICH.

AUGUST 1, 1921.

July is closing in Detroit with the same old story. Outside the automobile industry conditions are very quiet, although there is a fine optimistic spirit that gives the manufacturer hopes for better conditions later in the year. The automobile industry, as it has been in past months, is sustaining everything here. If people have no money for anything else they seem to have money for cars. The **Ford Motor Company** is running full tilt and plans for further increase in production. At the same time the trade is advised to look out for another reduction in price. One is expected some time late in the fall. There's nothing authentic about this report, but nevertheless it seems so reliable that forecasters do not hesitate to say that more cars of this popular make will be sold this fall than ever before. If Ford cuts again, it will mean still further cuts by other automobile makers, all of which, it is believed, will tend to keep the industry lively throughout the winter months.

Automobile accessory concerns also are going well, and will continue so as long as the general automobile trade keeps up. But conditions are far from bright in other lines of the brass, copper and aluminum trade. Manufacturers of plumbers' supplies still feel the pinch of hard times and the inactivity of the building industry. There seems to be no relief in sight for them just at present.

Labor is plentiful at this time. In fact it is too plentiful, and it is advisable to stay away from Detroit if any one is actually seeking work. Even skilled mechanics are a drug on the market.

The **Detroit Lead Pipe Works** evidently is planning further expansion. It has just given a mortgage for $100,000 in favor of the Union Trust Company, covering its property at 517 Second avenue, as securety for a bond issue of like amount to be used in completing the purchase of the property from the estate of Samuel Ferguson, who, before his death, was connected with the company. The Detroit Lead Pipe Works has been using the property under a lease.—F. J. H.

CLEVELAND, OHIO

AUGUST 1, 1921.

The turning point in industry in general, and reflecting advantageously to the metal and allied industries, is seen with the advance of summer and the nearer approach of the expected fall business revival. Plants related to the metal industry, notably the automobile factors, have indicated their intention of resuming operations on a larger scale. General manufacturing has started to turn out more product. More persistent efforts toward obtaining business have resulted in orders.

This improvement appears to be confined not to the immediate Cleveland district alone. At Fremont the **Herbrand Company,** supplying parts and supplies for automobile concerns, has reopened with 250 men employed. The progress at this plant follows the receipt of several big orders which have been pending for months. The **Henkel-Clauss Company, cutlery manufacturer,** has resumed operations. The **American Tube Company** at Lorain, has resumed upon a 45 per cent. basis. These are only a few of the indications of improvement in the northern Ohio district.

By far the most important announcement in connection with business expansion is that made this week by the **Glauber Brass Manufacturing Company,** claimed to be the largest manufacturer of brass goods used in waterworks, gas, heating and plumbing industries in the country. The company has purchased the entire plant of the Malleable Castings Company for a consideration said to exceed $750,000.

Following a shutdown for two weeks, the **Cleveland Metal products Company has resumed operations.** A large export order for immediate shipment is responsible for the resumption, officials explained.

Collinwood shops of the **New York Central Lines** have reopened after being closed five months. Six hundred men have been called back to work, representing half the original number employed. Cars are being put into good condition on the assumption that business in general has started to improve, explained Albert Ingalls, general manager of shops. A similar resumption has been made at the Big Four shops in Bellefontaine, which had not been operating since last February.

One of the best indications of the changed trend in the automobile industry is announced this week following a meeting of **Jordan Motor Car Company** distributors. Reports showed that the company has shipped 10 per cent. more cars during the second quarter of 1921 than it did during the same period in 1920, which last was the peak in the company's history. It is also reported that the product for the next four months has been sold, and that production will be maintained at the company's highest average.

Larger production is planned by the **Champion Spring Company** in the purchase of the **Champion Bed Spring Company's** property at Park avenue and West 63rd street. E. H. Lemke is president of the company. Bed springs, metal cots and steel couches are the company's specialty.

The **Lamson-Sessions Company** and the **Falls Rivet Company** have decided to amalgamate their interests, according to statement issued by George S. Case, general manager of the former concern. The purpose of the consolidation is for expansion. Both are among the oldest metal industry concerns in this section of the country. Any revision in the official slate and management of the consolidated companies will be announced later.—C. C. C.

LOUISVILLE, KY.

AUGUST 1, 1921.

Things are very slow in the local metal industry this month, this being true not alone of the coppersmiths but general metal industry, although in the precious metail industry the manufacturers report fair business on new work.

General industrial operation has been slow. The Louisville & Nashville and several other railroads have been having numerous cars built in independent shops, to escape union wage schedules of the Railroad Board, this resulting in consumption of a good many journals. Farm implement manufacturers are at a standstill, two local plants being down. The wagon and automobile industries are doing very little, the latter being practically on a 25 per cent. basis and the wagon trade is on a 10 per cent. basis or less.

Jobbers of mill supplies, machine tools, etc., report business as slow, being around 50 to 60 per cent. of normal, ranging as high as 70 per cent. in some instances.

The **Stege Brass & Plating Works** reports that most of its business this season is in plating, it having been fairly busy, especially on automobile work, in replating bright parts, light reflectors, etc. George Stege is running for a second term on the Board of Councilmen.

Tom Hines, of **Hines & Ritchey** and the **Standard Milk Machinery Company,** is back from a trip South and reports fair business in milk machinery.

Charles Schadt, of the **Independent Brass Works,** reports that there is very little doing just now, and the force has been cut to his partner, J. W. Rademaker, and himself, who are able to handle all business received at the present time.

At the plant of the **C. Lee Cook Company** a little business is handled, but with shipbuilding very slow, most of the business received is for repair parts or replacements. The company features production of metallic packing.

The **Standard Sanitary Manufacturing Company** has recently purchased several acres of foundry sand deposits near Leitchfield, Ky., and will secure molding sand from these deposits for its brass casting plant at Louisville.

The **Vendome Copper & Brass Works** is operating on a very slow bell at this time, the volume of business being so small that some departments have been down almost steadily of late.—A. W. W.

MONTREAL, CANADA

AUGUST 1, 1921.

While business conditions are nothing to brag about in the brass and non-ferrous lines, this past month there is a slight ray of hope. A general improvement is noted in building construction and the announcement of plans for several large structures is considered a favorable feature.

W. R. Cuthbert & Company, manufacturers of plumbers' and engineers' supplies, babbitt solders and white metals, 37-39-41 Duke street, are now occpying their new three-story building, which has taken the place of the one destroyed by fire.

In the manufacturing jewelry lines the situation is not promising and the plants are operating at a 35 per cent. basis. The prospects of a resumption in the fall do not seem to be encouraging.

Arrangements are in process for the forthcoming convention of the Society of Chemical Industry, which is to be held in Montreal during the last three days in August. This is the first time that the national society has held a convention in Canada and it is the second to be held in North America. Sir William Pope, K. B. E., F. R. S. C., is president but the honor will be conferred on Professor R. F. Rattan, M. D., F. R. S. C., of McGill University, during the election of officers. Dr. Rattan is the second man of this continent to hold the position, Dr. W. H. Nichols, of New York, having been president some years ago. At the close of the convention the entire British delegation is to make a tour of the principal cities and plants in the States.—P. W. B.

BIRMINGHAM, ENGLAND

JULY 19, 1921.

Three weeks ago the coal strike, which had lasted thirteen weeks, came to an end. Last week saw the termination of the dispute in the engineering trades, which it was feared would result in a stoppage affecting a million and a half workers. A three weeks' strike in the cotton textile industry involving some hundreds of thousands of spinning operatives and threatening a stoppage of the whole trade was settled at the end of June by the acceptance of the employers' terms, which meant reductions ranging from 55 to 70 per cent in wages.

The non-ferrous metal trades, though still upon the whole

affected less than most other trades by the general depression, are experiencing a slackness of business unprecedented for a generation. In the brass trade employment declined further during June and was generally bad. In the Brassworkers' Union of 34,900 members, 5,800 were wholly employed while of the remainder, 10,500 were working only about 24 hours a week. There has been a little improvement this month, but only a very small percentage of the works are open for anything approaching full time. An appreciable increase in business cannot take place till the general international financial situation improves and of this there is no sign. Hopes are entertained that business will begin to move in the autumn, but although inquiries are becoming more numerous they are not of a character which suggests early materialization into orders. The most favorable market at present is Australasia, from which orders, chiefly for heavy water and steam fittings continue to be received. Tube and rolling mills are now fairly busy, but chiefly upon arrears of work accumulated during the fuel shortage. The hearth furniture trade has been a little better employed than might have been expected at this time of year. Bedstead manufacturers have recently made considerable cuts in prices, but so far have made scarcely any progress towards the recovery of their foreign trade, while the home trade is suffering severely from the housing shortage.

Little if any improvement is reported in the jewelry and electroplate trades. One of the largest Birmingham firms of manufacturing jewelers, in its balance sheet for last year, shows only one-sixth of the profit made in 1919, and since the beginning of this year the returns of all firms show a further decline. A blow has been struck at the export trade by the limits which the Postmaster-General has placed upon the value of consignments by parcels post. The general effect of these regulations is to place a maximum ranging, for different countries, from £20 to £400, upon the value of any single parcel of jewelry.

An interesting event in the history of the British Brass Trade is the retirement of W. J. Davis from the secretaryship of the National Society of Brassworkers. Mr. Davis is one of the best known of the older school of trade unionists. In 1872 he left the factory in which, like his father, he worked as a brassfounder to become General Secretary of the National Society of Brassworkers and Metal Mechanics. He held that position with only one short interruption for more than 48 years. As one of the pioneers in labor representation, he sat on the Birmingham School Board and the Birmingham Town Council. In 1883 he was appointed factory inspector but 6½ years later he responded to a unanimous call to resume his trade union work. He has never sat in parliament, though in 1893 he fought for a seat in Birmingham against the late Jesse Collings. He has been president of the Trade Union Congress and was chairman of its Parliamentary Committee.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The main office of the **Dallas Brass and Copper Company** is now located at 820 Orleans street, Chicago, Illinois.

An **American syndicate,** the name of which is not divulged, is said to have purchased Bolivian tin property valued at $2,000,000. (See U. S. Commerce Reports, July 14, 1921.)

The Monarch Stamping Company, 1402 Fourth avenue, Detroit, has been incorporated with a capital of $25,000 to manufacture metal stampings, machine parts, etc.

The **Universal Crane Company's** general offices are in the Swetland Building, Cleveland. Their product is a 3- to 4-ton portable gasoline or electric locomotive crane for mounting to suit working conditions.

The **W. K. Knutson Mill and Manufacturing Company,** 1903 Burnett street, Wichita Falls, Texas, has been organized to manufacture refrigerators of a new type. They will require bids on metal stamping.

The **Allied Machinery Company of America,** 51 Chambers street, New York, have been appointed foreign representatives for the Universal Crane Company in all countries except the United States and Canada.

Norton Company, Worcester, Mass., manufacturers of grinding wheels, grinding machines and refractory products, announce that refractory materials will be billed at straight list price, the previous prices being list plus 10%.

The **Stafford Appliance Company,** La Porte, Ind., was recently incorporated with a capital stock of $50,000, to manufacture, sell and distribute through a sales organization improved tools and automobile supplies and accessories.

The contract for general repairs to the furnaces and other interior work at the plant of the **J. M. Craig Brass Foundry** on Arch street, Hartford, Conn., has been awarded to Charles P. Waterman, Inc., 75 Pratt street, and work has been started.

The **Societe Anonyme des Usines Giulini,** Basel, Switzerland, manufacturers of virgin aluminum ingots, notched bars, bars, plates and sheets, have appointed **C. W. Leavitt & Company** their sole selling agents for the United States and Canada.

Smith & McCrorken, Inc., distributors of zinc nails, tin plate, sheet lead, solder and other metal products, have annexed their office to their warehouse in Brooklyn, their new address being: office, 65 Engert avenue; warehouse, 67 Engert avenue, 43-53 Eckford street.

The **Corcoran Pressed Metal Company,** Indianapolis, Ind., has been organized with a capital of $100,000 to manufacture sanitary milk and cream cans and to do re-tinning of such work. The company operates a stamping, tinning and soldering department.

The **J. W. Paxson Company,** 1021 North Delaware avenue, Philadelphia, Pa., manufacturers of foundry equipment and supplies has filed plans for two shop buildings at Algon avenue and Luzerne street, to cost about $60,000, totaling 118 x 118 ft. This company operates boiler, machine forge, electric welding and pattern shops.

The Standard Parts Company, Cleveland, O., has as stated by the Receiver, Frank A. Scott, a cash balance of $1,538,209.90, and in consequence of this condition an application has been made to the court to authorize the receiver to pay a dividend of 10% on the indebtedness of the company. Hearing on the application is set for the 9th of August.

The **Oxweld Acetylene Company,** of Newark, N. J., manufacturers of Oxweld welding and cutting equipment, announce the removal of the offices of their Foreign Sales Department from Newark to No. 30 East 42nd street, New York. In this new location separate departments for sales, engineering, advertising, shipping and accounting have been established.

Two educational motion pictures illustrative of the mineral industry have recently been completed, the **United States Bureau of Mines** announces. The first of these, the Story of Abrasives, shows the generation of power at Niagara Falls, its utilization for the production of carborundum (silicide of carbon), and aloxide (aluminum sesquioxide), and finally the numerous interesting and important industrial operations that are performed with the aid of the abrasives thus manufactured. Requests for the loan of this film for showing at public gatherings where no admission fee is charged should be addressed to the Bureau of Mines, 4800 Forbes street, Pittsburgh, Pa.

The **Webster and Perks Tool Company** has sold its grinding and polishing stand and accessory department to the **Hill-Curtis Company,** Kalamazoo, Mich. By this transaction their successors have acquired all the drawings, patterns, jigs and tools, raw and finished materials, including stocks of finished machines, together with all engineering, production and sales records and data of this particular department; all of which properties have been transferred to their premises in Kalamazoo, and they are now prepared to continue this business. Open ledger accounts are not involved in this transaction and must be settled with the Webster and Perks Tool Company. The Hill-Curtis Company is an old concern, operating a well equipped foundry, forge and machine shop, etc., under competent management, and well adapted to manufacture this line. The Webster and Perks Tool Company intends to concentrate their facilities exclusively on the manufacture and sale of the W. & P. line of Universal and plain cylindrical grinding machinery.

The **Dominion Oxygen Company, Ltd.**, has broken ground at Montreal for a new quarter-of-a-million dollar oxygen plant which will double the company's present capacity. The building will be 100 x 100 ft., and will be substantially a duplicate of the company's Toronto plant, which until now has supplied oxygen to Canadian industrial users through five district distributing stations.

The **General Platers' Supply Company, Inc.**, at 489-493 Broome street, New York, announces that there is no longer any connection between it and the G. W. Kyle Company. The General Platers' Supply Company, Inc., will continue business from its sales office and warehouse, 489-493 Broome street, 'phone numbers Canal 8068 and 8069. Mr. H. L. Haas has been elected president of the General Platers' Supply Company, Inc., and has assumed the general management.

The **McCabe Company, Inc.**, 119 W. Freemason street, Norfolk, Va., was incorporated with a capital of $50,000, to manufacture and sell the McCabe Automatic Water Heater. Officers and incorporators are, Allen E. McCabe, president and treasurer; W. L. Ewing, vice-president and general manager, and W. J. Fielder, secretary. They are inventors and patentees of an automatic water heating attachment for oil or gas cookstoves to furnish hot water by utilizing the heat used in cooking. They do not at this time intend to manufacture this device themselves, but are now in the market to have same manufactured for them, and want to get in touch with manufacturers equipped to handle this work. It is a stamping job, requiring automatic stamping machinery, as the device is made of either sheet copper or brass, with a small collar stamped from black iron. They are also in the market for range boilers and hot water tanks of various sizes, and also want quotations on copper and brass tubing of 4" and 5" diameter, and on sheet copper or brass of 18 and 20 gauge. They are looking for a location for an assembling and shipping plant in some good live town in the East or Central States.

BRASS AND COPPER INDUSTRY OF CANADA

An official report on the brass and copper industry of Canada in 1919 (the latest statistics to be had) gives the number of individual plants as 59—39 in Ontario, 12 in Quebec, 3 in British Columbia, 3 in Manitoba, and 2 in New Brunswick. The total capital investment in that year was $15,054,981, consisting of land, buildings, and fixtures, $3,099,676; machinery, tools, etc., $3,285,942; materials on hand, stocks in process, etc., $3,362,238; and cash, trading, and operating accounts, etc., $5,307,125.

Employees numbered 2,778 males and 343 females, to whom salaries and wages aggregating $3,642,663 were paid in 1919. Employees earning $30 per week and over numbered 600.

Materials to the value of $7,194,157 were used, sheet and bar brass being the chief item. The year's output was valued at $18,760,311 and included: Brass and copper castings, $4,133,512 (selling value at works); sheet brass, $1,265,100; brass and copper sheets, $225,434; brass and copper tubes, $803,526; brass rods, $750,210; valves, $1,254,726; plumbers' brass goods, $744,473; electric fixtures, $514,619; brass fittings, $766,825; hardware, etc., $204,293; railway and marine goods, $346,393; all other brass goods, $130,695; iron and steel castings, $253,509; miscellaneous products, $2,330,791; custom and repair work, $36,172.—Commerce Reports, July 27, 1921.

STUDENTS' ELECTRIC FURNACE

A 60-kw. electric brass melting furnace of 200 lb. capacity, designed, built and operated by students, has recently been installed in the chemical engineering laboratories of the College of Engineering, University of Wisconsin, at Madison. This is believed to be the smallest commercial furnace of this type in the United States, and the state university is the only institution of its kind which possesses such a unit.

The shell and driving mechanism were made in the university mechanicians' department; the fire sand was produced in an electric resistor furnace in the chemical engineering laboratories. The foundation and lining were built entirely by students. The actual cost was $350, compared with a market price of $1,000 for a commercially manufactured unit.—Iron Age.

HOARDED COPPER STOVES

A Jekyll and Hyde mystery of the kind that would have delighted Robert Louis Stevenson has just been discovered by the police of Orleans, France. They arrested on a charge of burglary Ernest Boitier, owner of one of the finest residences in the district and controller of a big wholesale wine business. The burglar, or burglars, climbed in through a window of an iron-monger's shop and removed by means that have not yet been discovered, a large copper stove. How they got it out, whether through the window or through the door, the police cannot discover, but by accident they succeeded in tracking the stove to the cellars of M. Boitier.

Not only have they found this one, but when they searched the house they found in the cellars nearly a score more stoves of similar pattern to that which had been stolen from the ironmonger. How they came there and from where they came remains a mystery, as Boitier absolutely refuses to tell. All that he would confess to the police was that he robbed the ironmonger's store and dislodged the stove.

"It was in a moment of weakness," he declared, and the police are left to puzzle out how a successful business man and owner of one of the finest properties in the district came to have such curious weakness for copper stoves.

The arrest has caused consternation in Orleans where Boitier is well known and respected as a merchant and owner of the Château Desporbeaux.

According to the police the copper stoves in the cellars of the château have been stolen from houses and shops at different times in the last ten years. Complaints were made to them, but as no one suspected the merchant they could never be traced. But whether Boitier was a burglar for the sake of adventure or because he had a mania for the collecting of copper stoves is yet to be discovered.—N. Y. Times, July 19.

NEW ELECTRIC FURNACES ORDERED

The Electric Furnace Company, Alliance, Ohio, reports more orders for its Baily Electric Furnaces in June than in any single month in the last two years. These orders include standard brass melting units, car furnaces for steel plant purposes, and a special electric enameling equipment. Most of the sales were made to concerns not particularly busy at the present time, but who purchased this equipment with a firm belief that by the time the furnaces were installed and ready for operation business would be such as to amply justify the present expenditure.

Indications point to an equally good month in July. The foundries are exhibiting a desire to modernize their equipment so as to lower their cost of production and meet competition when business again becomes normal.

One of these recent sales, to the Empire Brass Manufacturing Company, Ltd., London, Ont., marks the fifth Baily furnace sold in Canada during the past year. It is the second Baily furnace for this plant. It is rated at 105 k.w., and has a hearth capacity of 1,500-2,000 pounds.

The Mueller Metals Company, Decatur, Ill., has ordered three 105 k.w. Baily furnaces, each with 1,500-2,000 pounds' hearth capacity. The entire battery will be used for melting brass in their Decatur plant.

The Ingram Richardson Manufacturing Company, Beaver Falls, Pa., has awarded a contract for a 600-k.w. Baily electric enameling furnace. This is to be a rotating car type furnace, arranged to travel on a circular platform 60 feet in diameter. The equipment will have a heating capacity of 44 tons of material per day.

ELECTRIC HEATING APPARATUS

The General Electric Company will have a large exhibit, comprising a variety of its products, at the Seventh National Exposition of Chemical Industries, to be held in the Eighth Coast Artillery Armory, New York City, September 12-17. The exhibit will occupy spaces 211, 213, and 215.

The features of the exhibit will be an automatic arc welding outfit, and a 50-pound brass melting furnace. The arc welding equipment will consist of a WD 9, 4-k.w., 200-ampere, 60/20-volt

generator direct connected to a 7½ hp., 2-phase, 60-cycle, 220-volt motor. The set will be in operation welding seams in large oil switch tanks, and also doing other miscellaneous work. The brass furnace will be a 50-pound type SM furnace, completely lined, with a crucible and electrodes in place, but without transformers or other electrical accessories. It is representative of a new type of muffled arc furnace recently developed by the company.

Further furnace exhibits will comprise a semi-cylindrical furnace, a small tool room muffled arc furnace used for treating tool steel, etc., in the shop, a soldering iron furnace for medium and heavy duty irons, and an automatic control board for a single electrode furnace, for 60-cycle, 230-volt operation.

There will also be a number of small electrically heated devices of various sorts, including a self-regulating metal melting pot for non-ferrous metals, a compound melting pot, jacketed and jacketless glue pots, a series of electric soldering irons of various sizes, and three examples of a new sheath wire unit just developed. These will include air heater, clamp on, and cartridge type units.

Other exhibits will consist of a 2-rivet heater, two field coils for a KT 20-hp. motor, showing different styles of insulation, and a high-tension filament heating transformer for use with 250-milliampere, 100,000-volt Kenetron tubes, and two 250-milliampere 100,000 Kenetrons.

TRANSMUTATION OF ELEMENTS

In a paper which he has prepared and submitted to Engineering Foundation, Dr. Charles Benson Davis, of New York City, claims that he can make and has made some of the chemical elements, such as gold, silver, platinum and copper, by the transmutation of a common element. He has shown samples of the metals he claims to have made to members of the Engineering Foundation in New York City, and has requested that body to investigate his claims and his methods. Doctor Davis is a reputable chemist, says Alfred D. Flinn, secretary of the Foundation, and is a member of the Society of Chemical Industry, a Fellow of the British Chemical Society, and an Honorary Member of the Société Académique d' Histoire Internationale. He has had papers published in chemical journals.—Mining and Metallurgy.

SHEET METAL CONTRACTORS

The Missouri Sheet Metal Contractors' Association is a voluntary association of representative sheet metal contractors in the state of Missouri.

The officers are: H. W. Symonds, president; Otto E. Scheske, secretary; Frank B. Higgins, treasurer. All of St. Louis.

Details can be obtained from the secretary, Otto E. Scheske, 2725 Morgan street, St. Louis, Mo.

To Create Demand for Silverware

Campaign Started to Show Advantages of Sterling Over the Plated Articles.

By this time next year some popular as well as trade misconceptions concerning sterling silverware will be corrected if a campaign, inaugurated by the Gorham Company and supported by other prominent houses, bears fruit. The preliminary steps in the way of trade missionary work have already been taken with a view toward removing the ignorance and indifference which have hampered the sale of sterling ware and even placed it at a disadvantage with plated goods. Representatives of the company have aroused the interest of dealers in silverware merchandising with such good results that the campaign gives promise of fully accomplishing its purpose. Boston was visited, for instance, and has greatly increased its sale of silverware, and, though no figures are available, there are reasons for believing the amount now being disposed of exceeds that of any other city.

A full outline of what the Gorham interests expect to accomplish was put before the convention of the National Wholesale Jewelers' Association last month by Franklin A. Taylor, president of the Gorham and affiliated companies, which include the Whiting Manufacturing Company, the Wm. B. Durgin Company, the Wm. B. Kerr Company and the Mt. Vernon Company, Silversmiths, Inc. In meeting the principal objection to the purchase of sterling silver and in describing the broad scope of the new merchandising plan, he said:

"There is a false notion that silver is expensive, when, as a matter of fact, it is economical, if we measure its everlasting qualities against the brief life of its substitutes, whether they be china or plate. Still another idea is that the initial cost is beyond the average pocketbook, when that average pocketbook yields two billion dollars every year for automobiles and alleged automobiles.

"This thought that only the wealthy can afford silver is not only implanted in the mind of the consumer but the trade as well. Statistics will prove, however, to any who will investigate, that the great middle class is today spending on less useful, less satisfactory things millions, yes billions, of dollars, much of which could be diverted to the purchase of fine silverware, if the facts were properly presented.

"That the public taste can be uplifted and moved along lines that lead to more solid and substantial purchases has been conspicuously proved in the furniture business during the last fifteen or twenty years. Recall to your mind the window displays of the furniture stores in your town that long ago and you will bring up a picture of cheap, tawdry stuff whose most conspicuous feature was its gingerbread decorations. But what do you find today, even in the cheaper store windows? You see chaste period designs and substantial construction; you see not only the bare necessaries in furniture, but elegant serving tables and neat, attractive tea wagons; you see for the living room comfortable lounging chairs; telephone stands, with special chairs for the same; you see special furniture for the enclosed porch, and you see, by the way, hundreds of these enclosed porches, nicely and tastefully furnished, in thousands of middle-class homes, many of them of the two-story type.

"All this reflects increased purchases upon the part of the average salaried worker and wage earner. It proves that good, substantial things that contribute to one's comfort, give satisfaction and appeal to pride of ownership of the beautiful can be and are being sold by the million right among the classes which are not generally looked upon as sterling silverware buyers.

"Back of all that may be said in regard to stimulating the sale of silverware and other merchandise handled by the jeweler lies the fundamental thought that expansion of business depends upon expansion of the perspective of your customer and his customers; not in trying to grab a larger share of existing business by enticing patronage from your competitors. We are applying that principle to the upbuilding of the sterling silver industry. We hope to inaugurate educational publicity that will arouse desire and quicken the will to possess in millions of persons now indifferent to the charms and advantages, the economy, usefulness, durability, beauty and lasting satisfaction which silver brings. We hope thus to create such a large, new demand for silverware that the entire industry will be benefited that our competitors will do a larger business as well as we. We are satisfied than an unselfish, broad-visioned course is, after all, the best course to take in self-interest, that the greater this industry grows, the greater and more successful the Gorham interests will be."

The prevalent notion that silverware is merely a gift article, the idea that plated ware is just as good for all ordinary purposes, the Sheffield "fake," foolish guarantees and the danger of loss, were some of the factors mentioned by Mr. Taylor as hampering the sale of solid silverware. In discussing them yesterday, he laid particular emphasis on discouraging the public and the trade from considering sterling as a gift article. Both from the standpoint of service and beauty, he said it should have its place in every home. In England the family "plate," which is solid ware, is the most distinctive possession of the household. He took occasion to explain the origin of Sheffield plate and its difference from present-day makes. Silver was originally too soft to fashion into flat ware. Sheets of it were worked by goldbeaters who

laid the metal over a base of copper or bronze. More silver was used than the basic metal. In the present manufacture of so-called Sheffield plate, the electro-plating process is employed with a minimum of silver deposit.

"Where the item of risk in losing solid silver is concerned," said Mr. Taylor, "it is enough to say that thefts are very small. Only the amateur burglar takes silverware on his visit, because of the difficulty in disposing of it. Marks that cannot be easily effaced lead to identifying it. If melted down to be sold, the purchaser makes strict inquiries which discourages any but the honest seller. The idea that it is unsafe to keep sterling silverware around the home because burglars have a particular preference for solid silverware is ridiculous, and was probably spread around to induce people to store their sterling in safety vaults and buy plated ware to use in its stead. Burglary insurance on silverware costs less than the rental of a safe deposit box. It is also inconsistent to stow away the most useful thing of value in the house in fear of burglary, while equally costly articles in the way of diamonds, jewelry and many other things as easily stolen as silverware are freely kept about the home."

From a trade standpoint, Mr. Taylor explained that missionary work is now being done to convince dealers that solid silverware is a profitable item; that it gives a store tone and prestige that can be gained in no other way, and that it causes the sale of other lines carried by the jeweler. The gross expenses of retail jewelry stores now show a considerable variance—from 18 to 50 per cent., in fact—and it is the purpose of this fieldwork to suggest means of avoiding high operating costs. Free engraving, the stocking of too many patterns and improper display are some of the trade evils which the Gorham representatives are combating.

"Since the word of our campaign has gone around," said Mr. Taylor, "we have received letters from even large manufacturers of plated ware commending our purpose. One concern expresses regret that it has pushed the sale of plated merchandise to the detriment of sterling, and wishes us success in our undertaking. Before we are through with our education of the public and the trade concerning facts in the silverware situation we will have courses in correct table setting, as well as in silverware design, given in the colleges. The domestic science course at Columbia this Summer, for instance, will include five lessons on the art of table setting, with special reference to the history of silverware and its design."—New York Times, June 26, 1921.

TRADE PUBLICATIONS

Bridgeport Ace.—A folder describing another tire pump manufactured by the Bridgeport Brass Company.

Doorways.—A booklet issued by the Richards, Wilcox Company, Aurora, Ill., describing their sliding door equipment.

Metal Etching.—A circular issued by John R. Baynes, 371 Washington street, Norwich, Conn., who gives instructions in etching.

Research Narratives, No. 12. Thermionics.—A folder issued by the Engineering Foundation, 29 West 39th street, New York City.

Research Narratives, No. 13. Radioactivity.—A folder issued by the Engineering Foundation, 29 West 39th street, New York.

Bridgeport No. 16 Tire Pump.—A folder on the new tire pump manufactured by the Bridgeport Brass Company, Bridgeport, Conn.

Why?—A folder issued by the Mueller Metal Company, Port Huron, Mich., illustrating and describing their brass and bronze forgings.

Speculating versus Investing.—A folder issued by the International Chemical Company, Philadelphia, Pa., setting forth the merits of their cleaning compounds.

"Copperweld" Wire.—A booklet issued by the Copper Clad Steel Company, Rankin, Pa., containing tables and other data concerning their copper clad steel wire.

Modern Polishing.—A booklet issued by the General Abrasives Company, Inc., Niagara Falls, N. Y., giving some practical notes on the selection and use of polishing materials.

G-R. Expansion Joint.—A circular issued by the Griscom-Russel Company, 90 West street, New York, describing and illustrating their new type low pressure steam line expansion joint.

Stratton Steam Separator.—Bulletin No. 1140, issued by the Griscom-Russell Company, 90 West street, New York, describing their steam separators for use with steam power plants.

Bulletin of the Metropolitan Museum of Art, June, 1921.—Issued by the Metropolitan Museum of Art, New York, contains description of art metal work, i. e., hardware and silverware.

Directions for Using Deoxidine.—A pamphlet issued by the American Chemical Paint Company, Philadelphia, Pa., describing Deoxidine and its use for preparing steel for painting.

Phono-Electric.—Bulletin No. 15, written in French, for foreign distribution, issued by the Bridgeport Brass Company, Bridgeport, Conn., describing their Phono-Electric Trolley Wire.

The Deister-Overstrom Diagonal Deck Table.—A circular issued by the Deister Concentrator Company, Fort Wayne, Ind., describing the principles on which their concentrator tables operate.

The Tank Without A Trouble.—A folder issued by the Belke's Perfect Tank Filter Company, Fisher Building, Chicago, Ill., describing and illustrating their new tank filter for plating tanks.

Curtis Steam Turbines for Mechanical Drive.—Bulletin No. 42019. A catalog issued by the General Electric Company, Schenectady, N. Y., setting forth the uses, principle and construction of this turbine.

Grinding Wet or Dry, Granular or Fine.—A folder issued by the Hardinge Conical Mill Company, 120 Broadway, New York, illustrating and giving the advantages and operating principles of the Hardinge Conical Mill.

Grinding Data.—A booklet issued by the Hardinge Conical Mill Company, 120 Broadway, New York City, the sixth of a series, presenting data on the operation of their 8 ft. diameter mills in the mining industry.

Concentrating Tables.—A reprint from *Coal Age* of the article "Concentrating Tables Turn Incombustible Sludge from Pond Into Good Fuel," sent out by the Deister Concentrator Company, Fort Wayne, Ind.

"Wilcharge" Pneumatic Truck.—A pamphlet issued by the American Foundry Equipment Corporation, 360 Madison avenue, New York, describing and illustrating their novel pneumatic truck for charging annealing ovens.

The Newtown Creek Industrial District of New York City.—A booklet issued by the Merchants' Association of New York, 233 Broadway, New York, setting forth the advantages of this district for industrial development.

Year Book 1921—American Foundrymen's Association.—Issued by the American Foundrymen's Association, Marquette building, Chicago, Ill., containing the names of the officers, boards, committees, the constitution and by-laws, and list of members.

Direct Current Mill Type Motors, Type MD and MDS.—Bulletin No. 48121. A catalog issued by the General Electric Company, Schenectady, N. Y., describing this type of new rugged motor designed particularly for such work as on heavy duty cranes, etc.

A Method of Accounting for Scrap.—A booklet issued by the National Association of Cost Accountants, 130 West 42nd street, New York, containing an article based upon a paper read before the Cleveland Chapter of the National Association of Cost Accountants.

Ryerson Handbook on Alloy Steels.—By G. Van Dyke. A booklet issued by Joseph T. Ryerson & Son, Chicago, Ill., describing the manufacture, handling, heat treating, etc., of alloy steels, and containing tables on tensile strengths, hardness, weight, temperatures, etc.

The De Laval Method of Centrifugal Clarification of Varnishes, Japans and Pigment Goods.—A catalog issued by the De Laval Separator Company, 165 Broadway, New York, describing and illustrating in detail their centrifugal clarifiers for this class of materials.

Conventionettes.—A folder of breezy items and personals about the 1921 Convention of the American Electro Platers' Society, held in Indianapolis, Ind., June 29-July 2, 1921. The folder is put out by the Indianapolis Plating Company, 633 Kentucky avenue, Indianapolis.

Final Declaration of the Eighth National Foreign Trade Convention.—A pamphlet issued by the National Foreign Trade Council, 1 Hanover Square, New York, containing the "Final Declaration" of the Eighth National Foreign Trade Convention, held in Cleveland, Ohio, May 4 to 7, 1921.

Iron and Steel in Sweden.—A well bound, nicely printed and illustrated book on the iron and steel industry in Sweden, published by A.-B. Svenska Technologforeningens Forlag, Postfack 644, Stockholm, Sweden, containing a list of producers and products, and descriptions of Swedish iron and steel works.

Lefax, July, 1921.—A monthly magazine issued by Lefax (Inc.), Philadelphia, Pa., containing articles and data on industrial, commercial, financial and other important subjects classified and indexed ready for filing in loose-leaf binders; the July issue containing among other industrial articles, the article on "Group Life Insurance" by Frank S. McManus, which appeared in the February issue of THE METAL INDUSTRY.

"Four Reasons."—A folder issued by the Armstrong Cork Company, Pittsburgh, Pa., describing the use of Nonpareil High Pressure Covering for the insulation of high temperature equipment, such as enameling or japanning ovens, evaporators, kettles and cookers, feed water heaters, etc.

American Sandblast Equipment.—A catalog issued by the American Foundry Equipment Company, 52 Vanderbilt avenue, New York, describing and illustrating their sandblast equipment, including rotary table rooms, automatic tables, revolving barrels, blast cabinets, pressure tanks, dust arresters and accessory equipment.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$480	$530
American Brass	100	145	151
American Hardware Corp.	100	125	130
Bristol Brass	25	13	18
International Nickel, com.	25	13½	14½
International Nickel, pfd.	100	75	85
International Silver, com.	100	28	35
International Silver, pfd.	100	83	89
New Jersey Zinc	100	116	118
Rome Brass & Copper	100	115	125
Scoville Mfg. Co.	100	275	300
Yale & Towne Mfg. Co.	...	230	240

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

METAL MARKET REVIEW

Written for THE METAL INDUSTRY by W. T. Partridge.

COPPER

AUGUST 8, 1921.

Business in copper throughout July was most unsatisfactory from a commercial standpoint. Statistically also developments were painful, not so much due to events in July as to fuller advices in regard to production and consumption during the first six months of the year.

Stocks of refined copper in the hands of American producers at home and abroad on July 1 were estimated to have been 720,000,000 pounds. Stocks of blister copper during the same period were reduced about 55,000,000 pounds, so that the total stocks of refined and blister copper on July 1 were approximately 1,090,000,000 pounds, being approximately the same as the combined refined and blister stocks held on January 1.

One fact of encouragement that is seldom taken account of is that heavy stocks of brass which existed in Europe and the United States at the end of 1920—500,000 tons—have been reduced by at least 200,000 tons, indicating that 450,000,000 pounds of this large surplus has gone into consumption at home and abroad in the last six or seven months.

Although the largest producers have made small effort to sell on an unwilling market, custom smelters and other small producers whose policy is not to accumulate stock have competed for orders with second hands and the result is that prices have dropped ½c. to ¾c. a pound on electrolytic, ½c. to 1c. a pound on Lake and ¼c. to ⅜c. a pound on casting. Speculators and other second hands have been particularly desirous of selling electrolytic and in the last few days orders have been taken at 12c. delivered for prompt August and September shipment against sales early in the month at 12⅝c. to 12¾c. Lake copper is difficult to sell at 12¼c. delivered for nearby shipment against 13c. asked at the beginning of the month. Casting copper today is offered at 11½c. f. o. b. refinery against 11¾c. to 11⅞c. at the beginning of the month. Casting has been sustained by an export demand from the Orient.

TIN

Fluctuations in prices of tin during July covered even a wider range than in June, 3¼c. per pound in July as compared with 2½c. in June, but the net decline for the month was 2⅝c. per pound. The month began with an advance from the June closing to 29.25c. for spot Straits and American pure, and 28.37½c. for 99 per cent. metal and by July 5 had carried ⅝c. per pound higher, the proposed new duty having stimulated speculative operations. Weakness developed, but on rumors of resumption of operations in Pittsburgh tinplate mills prices were marked up ½c. per pound July 22. As the days passed without appearance of such consuming demand, prices receded to the lowest levels of the month, 26c. for spot Straits and American pure, 25c. for 99 per cent. metal. In the closing days, there was some recovery, upon inquiries that indicated genuine buying interest, with closing prices 26.62½c. for spot Straits and American pure, and 25.75c. for 99 per cent. metal.

LEAD

Demand for lead, which during the first six months of the year was on an average better than that for other metals, fell off in July through depression in general industries. The call for white lead, and which for several months was a feature, has been superseded by an increasing demand for storage battery lead. While the statistical position is considered favorable, the outlook is for slack demand over the remainder of the summer. Prices in July opened unchanged, 4.20-4.30c. East St. Louis, 4.45c. New York for prompt and early in the outside market, the American Smelting & Refining Company quoting 4.40c. East St. Louis and New York. The leading interest made no change in its basis throughout the month. The closing was down to 4.20c. East St. Louis bid and asked with New York quoting 4.40-4.45c. bid and asked.

ZINC

The zinc market in July failed to make recovery from the depression in trade and prices. Production has been drastically curtailed. Consumption, however, is extremely limited and prices inevitably declined. The market opened at an advance of five points, 4.25-4.30c. East St. Louis, 4.75-4.80c. New York on prompt and early asking prices over the June closing. Light offerings and better sentiment due to the expected new tariff, carried prices to 4.35c. East St. Louis, 4.85c. New York by July 5 for prompt and early, while for August and September shipments a five-point premium each over the preceding month was asked. These levels were

maintained until July 12, when a decline began which was not halted until July 21, with the lowest quotations of the month 4.20c. East St. Louis, 4.70c. New York. Then, due to the passage by the House (it is yet to be confirmed by the Senate and signed by the President) of the Fordney bill, carrying an even greater tariff than in the bill as originally presented, prices were marked up five points, but the market did not respond and on July 29 quotations were down to 4.20c. East St. Louis, 4.70c. New York, these levels showing a net decline of five points for the month.

ALUMINUM

Prices were quoted, nominally unchanged until July 15, when the Aluminum Company of America announced a new schedule reducing 99 per cent. plus virgin 3½c. per pound to 25c.; 98-99 per cent. ingots to 24.50c.; No. 12 alloy to 24c. and sheets 19ga to 39.10c., all f. o. b. producer's plant in 15-ton lots. The reduction was made late on Friday and it was not until the following Monday, July 18th, that outside quotations were cut ½c. per pound to 22-23c. for virgin 98-99 per cent.; 1c. per pound, each, on 98-99 per cent. remelted to 19-20c. and on No. 12 remelted, to 17-18c. These prices were in force over the remainder of the month. Thus, it is seen that the producer's schedule is still 2 to 2½c. above prices for importation in the outside market. Sheets for importation in the latter half of the month were freely offered 37-37½c., f. o. b. New York, but demand for any kind of aluminum has fallen off until the market is almost at a standstill.

ANTIMONY

In the prevailing dullness, prices of antimony continued to sag during July, going below the record low, 4.75c. per pound, duty paid, spot, wholesale New York, established in June and which was quoted unchanged until July 12, when a decline to 4.65c. was noted. This level failing to bring out any inquiry, quotations were again shaded July 29, to 4.60c. per pound, making a total decline of 15 points for the month. Antimony, in the deflationary movement, has broken more than any other metal.

SILVER

Prices of bar silver of foreign origin fluctuated over a range of 3⅞c. per ounce from the lowest level, 58½c. July 1 and 2, to the highest level, 62⅜c. July 28. With the closing, 61¼c., July 30, there was a net advance of 3¼c. during the month.

United States purchases of domestic silver under the Pittman Act, had on July 21 reached a total of 63,251,816 ounces. Importations were $6,408,768 in excess of exports in the six months period. Silver dollars minted in June amounted to $4,647,000, the total coinage of silver dollars under terms of the Pittman Bill, on June 30, amounted to $19,043,000.

QUICKSILVER

Quicksilver prices in July were unchanged at the June closing, $46 per flask of 75 pounds each, until July 18, when more active inquiry caused an advance to $47. With cessation of inquiry and no business done, prices on July 21 were marked off to the opening level, $46.

PLATINUM

Large supplies, absence of demand and pressure made in the effort to effect sales during July, brought about a reaction in prices to $65 per Troy ounce for pure late in the month from $72-75 quoted at the end of June. A total decline of $10 per ounce in asking prices and of $7 per ounce in prices bid.

OLD METALS

The July opening in old metals showed a further decline of ½ to ¾c. per pound from June closing levels, affecting the coppers, new brass clippings, No. 1 composition scrap, old zinc, clean red car boxes and electrotype dross. Some business in lead was done in third week, battery lead leading. Toward close of the month there was good demand for aluminum scrap from the West, but high transportation rates prevented consummation of business. Prices, however, had recovered somewhat on the items suffering heaviest declines at the beginning of the month, light copper being up to ¾c. to 7.50c. per pound. The aluminums recovered ½c. each on clean turnings and borings to 4.50c. and old sheet to 9c., but clippings were still quoted 11c. and old cast 9c. Battery lead was up ½ to 1½c. per pound and new type shell cuttings 1c. to 6c. per pound. Block tin pipe was off 1c. to 22c., new zinc scrap ¼c. to 2½c. per pound. Sentiment was not cheerful when the month was ended.

JULY MOVEMENT IN METALS

	Highest	Lowest	Average
Copper:			
Lake	13.00	12.50	12.753
Electrolytic	12.62½	11.75	12.347
Casting	11.87½	11.50	11.684
Tin	29.87½	26.00	27.694
Lead	4.40	4.20	4.279
Zinc (brass special)	4.50	4.30	4.381
Antimony	4.75	4.60	4.677
Aluminum	23.00	22.00	22.625
Quicksilver (per flask)	$47.00	$46.00	$46.50
Silver (cts. per oz.) Foreign	62⅜	58½	60.26

WATERBURY AVERAGE

Lake Copper.—Average for 1920, 18.06—January, 1921, 13.75—February, 13.50—March, 12.625—April, 12.75—May, 13.125—June, 13.125.—July, 12.875.

Brass Mill Zinc—Average for 1920, 8.33—January, 1921, 6.05—February, 5.50—March, 5.25—April, 5.20—May, 5.30—June, 5.00—July, 4.80.

Metal Prices, August 8, 1921

NEW METALS

Open Market

	Cents
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots, delivered	12c.
Lake, carload lots, delivered	12¼c.
Casting, carload lots, delivered	11¾c.
TIN—Duty free.	
Straits, carload lots	26c.
LEAD—Duty, Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	4.50
ZINC—Duty 15%.	
Brass Special	4.80
Prime, Western, carload lots	4.70
ALUMINUM—Duty, Crude, 2c. per lb. Bales, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb f. o. b. factory	....
Ton lots, f. o. .b factory	21-25
ANTIMONY—Duty 10%.	
Cookson's Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	4.60
NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%.	
Ingot	41.00
Shot	41.00
Electrolytic	44.00
MANGANESE METAL—95-98% Mn., carbon free, per lb. Mn. contained	0.75
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.25-1.35
BISMUTH—Duty free	1.50-1.55
CADMIUM—Duty free	1.00-1.10
CHROMIUM METAL—95-98% Cr., per lb. Cr. contained	1.50
COBALT—97% pure	Nominal 3.00-3.25
QUICKSILVER—Duty 10% per flask of 75 lbs	46.00
PLATINUM—Duty free, per ounce	65.00
SILVER—Government assay—Duty free, per ounce	.99¼
GOLD—Duty free, per ounce	20.67

Metal Prices, August 8, 1921

INGOT METALS

Silicon Copper, 10%	according	to	quantity	36	to42
Phosphor Copper, guaranteed 15%	"	"	"	17	to33
Phosphor Copper, guaranteed 10%	"	"	"	16	to32
Manganese Copper, 30%	"	"	"	50	to56
Phosphor Tin, guarantee 5%	"	"	"	35	to45
Phosphor Tin, no guarantee	"	"	"	35	to45
Brass Ingot, Yellow	"	"	"	8½	to11¼
Brass Ingots, Red	"	"	"	12¼	to14½
Bronze Ingot	"	"	"	13½	to16½
Parsons Manganese Bronze Ingots	"	"	"	16½	to18
Manganese Bronze Castings	"	"	"	27	to36
Manganese Bronze Ingots	"	"	"	13	to16
Manganese Bronze Forgings	"	"	"	30	to40
Phosphor Bronze	"	"	"	24	to30
Casting Aluminum Alloys	"	"	"	20¼	to22¼
Monel Metal	"	"	"	38	

OLD METALS

Buying Prices		Selling Prices
9 to 9½	Heavy Cut Copper	10½to11
8½to 9	Copper Wire	10 to11
7½to 8	Light Copper	9 to 9½
9 to 9½	Heavy Machine Comp.	10½to11
5½to 6	Heavy Brass	7 to 7½
3½to 4	Light Brass	5 to 5½
4¼to 4½	No. 1 Yellow Brass Turnings	5¼to 5½
6½to 7	No. 1 Comp. Turnings	8 to 8½
3½	Heavy Lead	4
3½	Zinc Scrap	4
4½to 5	Scrap Aluminum, Turnings	6½to 7½
10 to11	Scrap Aluminum, cast alloyed	12 to13
13 to14	Scrap Aluminum, sheet (new)	15 to16
18	No. 1 Pewter	22
14½	Old Nickel anodes	16½
22½to24½	Old Nickel	26½to28½

Prices nominal—No market.

BRASS MATERIAL—MILL SHIPMENTS

In effect July 6, 1921.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.15¾	$0.17¼	$0.18½
Wire	.16¾	.18¼	.19½
Rod	.13¾	.18¼	.19½
Brazed tubing	.27	....	.31¾
Open seam tubing	.27	....	.31¾
Angles and channels	.32	....	.36¾

To customers who buy less than 5,000 lbs. in one order.

	High Brass.	Low Brass.	Bronze.
	Net base per lb.		
Sheet	$0.16¾	$0.18¼	$0.19½
Wire	.17¾	.19¼	.20½
Rod	.14¾	.19¼	.20½
Brazed tubing	.28	....	.32¾
Open seam tubing	.28	....	.32¾
Angles and channels	.33	....	.37¾

SEAMLESS TUBING

Brass, 18½c. to 19½c. per lb. base.
Copper, 21c. to 22c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin, Bronze Rod	18¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	15¾c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	16¾c. " "
Muntz or Yellow Metal Rod	13¾c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	20c.-21½c. net base
From stock	21c.-25¼c. net base

BARE COPPER WIRE—CARLOAD LOTS

14¼c. to 15¼c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	18½c. per lb. base
100 lbs. to 300 lbs. in one order	19½c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 10c. basis less 8 per cent. discount.

Casks, jobbers' prices	11c.-12½c.
Open casks, jobbers' prices	11c.-13c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	39c.
Aluminum coils, 24 ga. and heavier, base price	33½c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	29¼c. per lb.
15% "	31½c. " "
18% "	32½c. " "

Nickel Silver Wire and Rod

10% Quality	31c. per lb.
15% "	35¼c. " "
18% "	38c. " "

MONEL METAL

Shot	35
Blocks	35
Sheet Bars	40
Hot Rolled Rods (base)	42
Cold Drawn Rods (base)	56
Hot Rolled Sheets (base)	55

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25s. over. Above prices f. o. b. mill.

Lead Foil—base price—figured on base price of lead at the time.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 61c. to 63c. per Troy ounce, depending upon quantity.

Rolled sterling silver, 61c. to 64c.

NICKEL ANODES

85 to 87% purity	.50c. per lb.
90 to 92% "	.52½c. per lb.
95 to 97% "	.55c. per lb.

Supply Prices, August 8, 1921

CHEMICALS

In Commercial Quantities

Acid—		
Boric (Boracic) Crystals	lb.	.15
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02½
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.07½
Nitric, 42 deg. Carboys	lb.	.07¾
Sulphuric, 66 deg., Carboys	lb.	.02½
Alcohol—		
Denatured	gal.	.38
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.05
Aluminum sulphate, commercial tech	lb.	.03-.04
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.04
Sulphocyanide	lb.	.75
Argols, white, see Cream of Tartar	lb.	.30
Arsenic, white, Kegs	lb.	.07½
Asphaltum	lb.	.35
Benzol, pure	gal.	.40
Blue Vitrol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06½
Calcium Carbonate (Prescipitated Chalk)	lb.	.05
Carbon Bisulphide, Drums	lb.	.08
Chrome Green	lb.	.40-.45
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.48
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.63
Sulphate, Barrels	lb.	.06
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.28
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton.	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.25
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.31
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.12-.13
Yellow Oxide (Litharge)	lb.	.09
Mercury Bichloride (Corrosive Sublimate)	lb.	.85
Nickel—		
Carbonate Dry	lb.	.50-.55
Chloride, 100 lb. lots	lb.	.30-.40
Salts, single, bbls	lb.	.12-.13
Salts, double, bbl	lb.	.14-.15
Paraffin	lb.	.07-.10
Phosphorus—Duty free, according to quantity		.30-.35
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.06
Electrolytic, 70-75% fused	lb.	.10
Potassium Bichromate, cacks	lb.	.13
Carbonate, 80-85%, casks	lb.	.07
Cyanide, 165 lb. cases, 94-96%	lb.	.50
Pumice, ground, bbls	lb.	.05
Quartz, powdered	ton.	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.40
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.07
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.42
Soda Ash, 58%, bbls	lb.	.03
Sodium—		
Biborate, see Borax, bbls	lb.	.06½
Bisulphate, tech. bbls.	lb.	.05½
Cyanide, 96 to 98%, 100 lbs	lb.	.28-.30
Hydrate (Caustic Soda) bbls	lb.	.04½
Hyposulphite, kegs	lb.	.05
Nitrate, tech. bbls	lb.	.04½
Phosphate, tech., bbls	lb.	.06
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.65
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12-.13
Sulphur (Brimstone) bbls	lb.	.03
Tin Chloride	lb.	.40
Tripoli	lb.	.03½
Verdigris, see Copper Acetate	lb.	.48
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.20
Whiting, Bolted	lb.	.03-.06
Zinc, Carbonate, bbls.	lb.	.07
Chloride, 600 lb. lots	lb.	.10-.12
Cyanide	lb.	.46
Sulphate, bbls.	lb.	.03½

COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$25.35
14 " 20 " 64/68, "	"	31.50
12 " 20 " 84/92, "	"	38.90
14 " 20 " 84/92, "	"	53.00
Sewed buffs, per pound		
Bleached and unbleached	"	.45

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.
Diameter— 6" to 24"	½" and ¾"	$3.20
" 6" to 8"	1" to 3"	2.30
" 10" to 16"	1" to 3"	2.30
" over 16"	1" to 3"	2.50
" 6" to 24"	over 3"	2.70
GREY MEXICAN OR FRENCH GREY—		
Diameter— 6" to 24"	½" and ¾"	3.10
" 6" to 8"	1" to 3"	2.20
" 10" to 16"	1" to 3"	2.20
" over 16"	1" to 3"	2.40
" 6" to 24"	over 3"	2.60

Above are even diameters. Odd diameters 50c. advance.